

Managing downside risk in institutional investment portfolios

Preventive medicine, minor surgery, and catastrophic healthcare coverage



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In an environment with low return expectations from most traditionally defined asset classes, sensitivity to potential drawdowns in a portfolio's value becomes more critical than ever. While overallocation to equity is a common culprit, it is not the only source of downside risk; and value-at-risk (VaR) reduction¹ at the total portfolio level must be targeted at phases throughout portfolio construction. Potential solutions for managing downside risk are discussed via analogy to a more familiar concept of managing personal health and wellness:

1. Preventative medicine
2. Minor surgery
3. Catastrophic healthcare coverage

The result is a framework for building a risk-centric foundation, followed by increasingly targeted hedges that are meant to earn their keep in more challenging environments rather than in moderate-to-good times.

As asset owners, or more often asset stewards, we face pressure to meet increasingly aggressive return objectives. Success in achieving these objectives ultimately requires taking risks; however, in doing so, we expose ourselves to failure scenarios with increasing probability. While we all know that return seeking can increase risks, the reach for return often dominates risk considerations. Downside risk management can be relegated to the background until the markets stop cooperating with our primary goal. Why? Strategic asset allocation are generally "optimized" for maximum expected return for a given level of risk, as defined by standard deviation of returns.

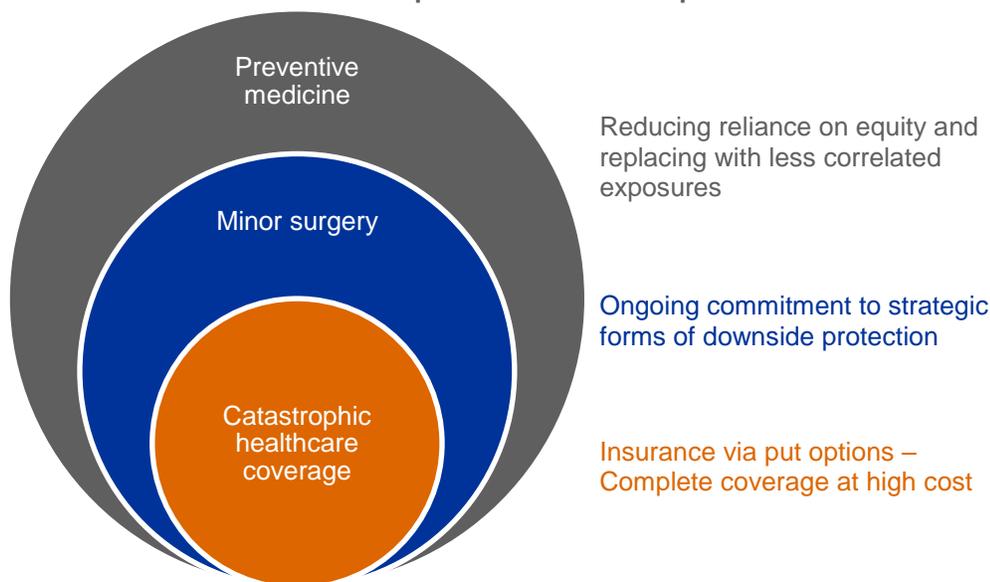
Such a deterministic view of investment returns requires a long enough investment horizon to play out favorably. Major setbacks due to market turmoil over shorter horizons might not only impair the chances of reaching the long-term investment objectives, but also open investors to scrutiny along the way. These setbacks are typically tail events that do not fit nicely into common risk measures like standard deviation as the downside tail is deeper and has a higher probability of occurrence than a normal distribution of returns would generally suggest. The problem with conventional definitions of risk, in symmetrical volatility terms, is that it ignores the disproportionate impact from outliers that are much worse than the central expectation. Major drawdowns in portfolio value create particular challenges to efficient wealth accumulation in the presence of regular outflows (e.g. benefit payments), since they necessitate selling portfolio assets at an inopportune time and price. Whether via mildly reducing the expected return from the portfolio or replacing the expected return drag of various forms of protection with offsetting modifications to portfolio structure, asset allocation decisions require greater emphasis on reducing VaR to keep all realized outcomes “survivable.”

While regulations, or large proportional funding requirements, might justify using more “insurance” in some instances, ongoing management of downside risks generally requires a more integrated and diversified approach. Insurance should be the last component considered in building an investment program with a holistic balance between expected return capture, and drawdown mitigation over key time horizons.

The health of an investment program (regarding downside risk), relates readily to a very familiar concept of wellness. Healthcare has become an area of increasing societal concern. Broadening the segment of the population with medical coverage is a very costly task since the uninsured segment often bears a higher health-risk profile. Historically, the fully employed population segment got used to an “all-you-can-eat” plan for healthcare insurance, with low deductibles and very little incentive alignment for overall cost containment. As medical technology progresses at a breakneck pace, the possibility of successfully treating serious health conditions is improving rapidly; however, the complexity and cost of those solutions are driving up the cost of insurance based on the former status quo of “Cadillac” coverage². In response, we are all seeing pressure to move to high deductible insurance plans, which often come with behavioral incentive programs with hope of reducing the incidence of more expensive treatments for advanced conditions.

Managing portfolio downside risk deserves a similar decision framework, as we can ill afford to over-insure in this case either. There are foundational actions to improving one’s health *before* designing an insurance plan and shopping for quotes.³

Exhibit 1: Potential measures to improve downside risk profile



Whether via mildly reducing the expected return from the portfolio or replacing the expected return drag of various forms of protection with offsetting modifications to portfolio structure, asset allocation decisions require greater emphasis on reducing VaR to keep all realized outcomes “survivable.”

Assess catastrophic coverage after broader measures enacted, as insurance must be tailored to each user’s needs.

Reducing strategic commitment to equity (*Preventive medicine*)

The simplest and cheapest way to reduce downside risk from equity exposure is to reduce strategic exposure to equity. For most, aggressive return targets make this a difficult change to enact.

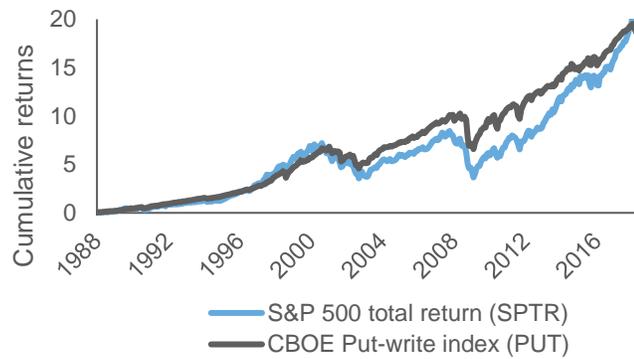
Ways to reduce equity allocation without reducing expected return:

1. **Removing the no leverage constraint** to allow for greater return impact from lower risk assets with higher Sharpe ratios
2. **Using derivative overlay** for capital-efficient alpha generation
 - a. **Conditional exposure to equity risk** – intentional movements into or out of equity can be managed to generate incremental return by using the allowable policy range in an opportunistic and loss-aware fashion
 - b. **Dynamic, non-directional exposure to currency** or other markets with a long/short portfolio structure
3. **Replacing some equity with a related exposure** having reduced drawdown characteristics – Offering equity insurance to the marketplace might ultimately allow for a better risk/return tradeoff in lieu of a higher equity allocation. Selling put options captures a risk premium as the market implicitly pays “insurance” providers over time. In addition, imperfect correlation to equity return can make this a strategic exposure that should be accessed on an ongoing basis. Shorting the implied volatility of equity markets can fit into an investment policy in two ways:
 - a. **Within the public equity allocation** – Call overwriting (of an underlying equity portfolio), or put-writing (over a portfolio of cash equivalents), can create equity-like returns over long periods, with about 70% of the volatility of underlying equity. While there are several ways to achieve this sort of performance pattern, Exhibit 2 demonstrates a specific index known as the Chicago Board Options Exchange (CBOE) Put-write index (PUT)⁴, which writes at the money put options monthly to generate premium and investment risks for the portfolio. It is shown in comparison to the S&P 500 Total Return Index (SPTR) patterns as the appropriate “full-risk” variant. PUT considerably reduced the depth and recovery time in major drawdowns, but has had trouble keeping up with SPTR over the relentless bull rally of the past five years.
 - b. **Within an alternatives allocation (via hedge funds or lower fee alternative beta strategies)** – Harvesting the volatility premium does not require bearing the full downside of committed equity exposure. Isolating the volatility premium is possible by removing the residual equity market exposure that comes from shorting equity index put options (known as daily delta hedging⁵). The result of such activity is to generate a better absolute return pattern over time that is considerably milder than equity in terms of downside risk. As a proxy for this type of strategy, we have chosen the UBS US Delta Hedged Strangle Index (MBCIDUST)⁶ as an appropriate benchmark for such an alternative beta exposure. Historically, MBCIDUST has considerably reduced the depth and length of drawdowns compared to SPTR, and has provided useful asymmetry between upside and downside capture in terms of monthly returns. In addition, it has also compared quite favorably to the HFRI Hedge Fund of Fund Composite (HFRIFOF)⁷ in terms of returns and drawdown characteristics. There are numerous strategies for isolating this purer form of the volatility risk premium, and investors should understand the risk controls in any method employed (a discussion of which is beyond the scope of this paper).

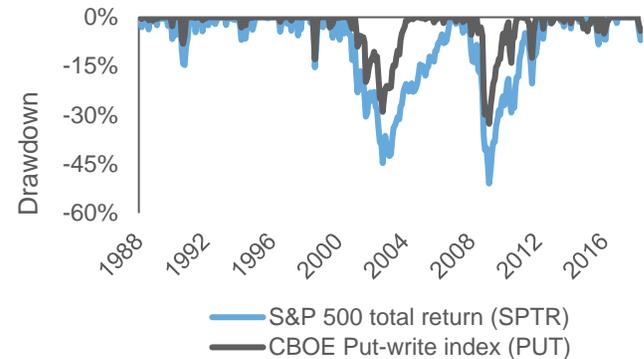
The simplest and cheapest way to reduce downside risk from equity exposure is to reduce strategic exposure to equity.

Exhibit 2: Comparison of return and drawdown behavior of SPTR and PUT

Cumulative returns



Drawdown



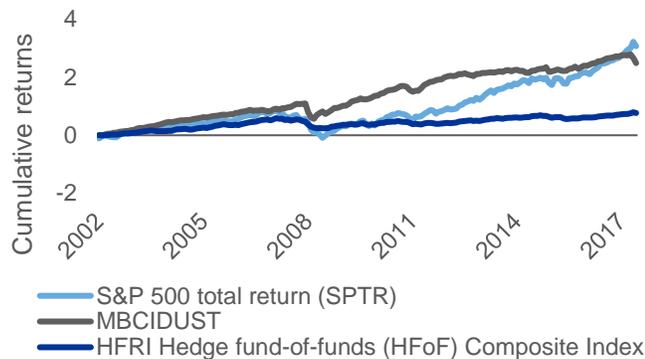
EXPOSURE	MTD	QTD	YTD	1 YR	3 YR	5 YR	ITD
SPTR	-2.54%	-0.76%	-0.76%	14.07%	10.91%	13.31%	10.46%
PUT	-1.34%	-2.60%	-2.60%	4.23%	7.34%	7.23%	10.38%

MEASURE	SPTR	PUT
Annualized return	10.46%	10.38%
Annualized std dev	14.04%	9.39%
Tracking error	0.00%	8.35%
Beta	1	0.55
Correlation	1	0.82
Worst drawdown	-51.0%	-32.7%
Up capture	100%	62.5%
Down capture	100%	37.4%

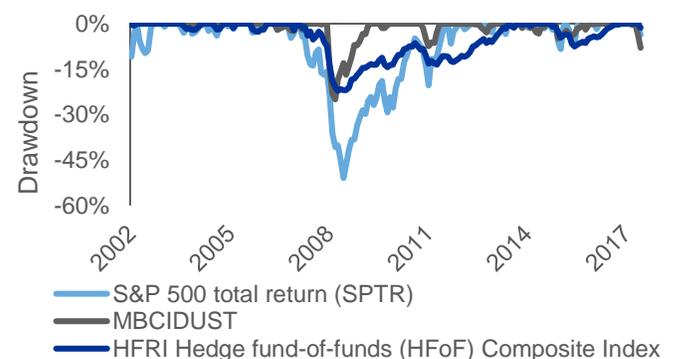
Return period Dec 31, 1987 - Mar 31, 2018, full history of PUT Index

Exhibit 3: Comparison of return and drawdown behavior of SPTR, HFRIFO, and MBCIDUST

Cumulative returns



Drawdown



EXPOSURE	MTD	QTD	YTD	1 YR	3 YR	5 YR	ITD
SPTR	-3.69%	1.83%	1.83%	17.10%	11.14%	14.73%	9.48%
MBCIDUST	-4.76%	-7.97%	-7.97%	-1.67%	2.62%	2.37%	8.41%
HFRIFO	-1.33%	0.96%	0.96%	6.75%	2.32%	3.71%	3.77%

MEASURE	SPTR	MBCI DUST	HFRIFO
Annualized return	9.48%	8.41%	3.77%
Annualized std dev	13.80%	7.48%	4.85%
Tracking error	0.00%	12.91%	11.15%
Beta	1	0.21	0.24
Correlation	1	0.39	0.67
Worst drawdown	-51.0%	-25.0%	-22.2%
Up capture	100%	41.0%	30.4%
Down capture	100%	9.5%	24.8%

Return period Aug 31, 2002 - Feb 28, 2018, full history of MBCIDUST Index

Adding strategic protection (*Minor surgery*)

Strategic protective positions are generally held in lieu of another exposure, so there is a decision between two mutually exclusive holdings. An exposure is strategic if it can be consistently held over longer periods of time. Besides limiting the timespan of a hedge, there are other means for reducing the expected return drag of protection for strategic use.

1. **Hedging the “left shoulder” of the return distribution** of an equity holding while retaining some downside to extreme correction – Buying a put-spread to hedge equity, rather than buying a single put, can considerably increase the expected return of a hedged equity position. The capital efficiency of an overlay allows for either strategic or tactical use.
2. **Futures-based option replication** – Academic research has progressed considerably since the early days of Constant proportion portfolio insurance (CPPI), and next-generation algorithms have improved upon some of the complaints with that approach as implemented in the 1980s.⁸ Specific discussion requires more detail, but these can be economical hedges that bear no upfront cost. They do impact upside return capture, relative to not hedging, and tend to outperform option hedges in strong up, or prolonged down, markets. Their biggest imperfection is residual exposure to gap risk on the first day of a major market correction (before delta is removed). These strategies also incur additional return drag in very choppy, non-directional markets.
3. **Cross-asset or proxy hedges** – Provides potentially cheaper downside protection; however, the reliance on correlation means less certainty of desired response during market correction.
 - a. **VIX-based instruments**⁹ can fit in this category as they not only require depth of a correction, but also require a given level of swiftness to offset market losses. These generally work better as a part of a dynamic strategy due to the high cost of carrying long VIX exposure for extended periods.
 - b. **Treasuries or other “risk-off” exposures** (JPY, Gold, Oil, etc.) can be held in greater amounts. Relationships should be considered with caution as negative correlation response to an equity correction is not guaranteed. Outside of Treasuries, these generally work better as part of a dynamic strategy that is also targeting gradual return generation over periods between equity corrections.
 - c. **Large basis risks** can be accepted in hedging a specific equity exposure that might be a cheaper hedge in relative terms.

The need for protection is not constant, it waxes and wanes based on a shifting balance of concern over downside risk and on the changing costs of protection.

Managing extreme tail-risk (*Catastrophic healthcare coverage*)

Tactical protection of buying put options

The need for protection is not constant, it waxes and wanes based on a shifting balance of concern over downside risk and on the changing costs of protection. “Insurance” (in the form of equity index put options) present a high opportunity cost and should only be used in a tactical fashion. Ongoing or strategic use would severely erode expected returns on a hedged allocation to equity. The cost of this protection is measured as drag on the equity return being protected. In the case of a put, the maximum cost of protection is the premium paid, but this is mitigated to the extent that options expire, or are sold, with positive value. Exhibit 4 shows the relationship among strike, probability of expiration in the money and upfront premium for a put option.

Exhibit 4: Relationship between strike price, premium and probability of gain



Higher probability hedges cost more in terms of premium, but bear a higher probability of being closed out at a profit at some point before expiration. Low probability hedges, or classic tail-risk hedges, cost less in terms of premium, but will most often expire worthless. The optimal time for closing a tactical option hedge is often before expiration, so the timing of a sell decision is arguably more important than the decision to hedge in the first place. Put options with strike levels well below current market levels must be monetized after a correction occurs. In stressed market conditions, these monetization opportunities last for hours or minutes, but do not persist for days. Without keeping the finger on the trigger, and standing ready to close out the hedge at an opportune time, an investor can lose much of the potential “lottery style” payoff when a low probability event occurs and a hedge responds as it was intended to. In addition, spreads on these options widen considerably in stressed market conditions and there is uncertainty whether hedging positions can be closed at an optimal time.

Strategic exceptions for buying puts

Strategic objectives or funding needs might create a situation where a given amount of capital needs to be available with certainty. Setting expiration to key date and strike to critical market level of interest can provide this certainty over a set time horizon. Even if the purpose is strategic, this type of hedging has greater expected return drag on the total portfolio and hedges should most likely not be rolled on a recurring basis after the key funding event.

Practical considerations to enacting measures to reduce drawdown risk

Even the best plans are ill-fated without the appropriate accountability structure. Where does downside risk management fit within the fiduciary accountability structure? Exhibit 5 shows the “Fiduciary ladder” that Russell Investments uses to map accountability in building actionable plans.

Even the best plans are ill-fated without the appropriate accountability structure. Where does downside risk management fit within the fiduciary accountability structure?

Exhibit 5: Fiduciary ladder



Preventive medicine starts at the governance level with the courage and conviction to alter the strategic asset allocation and take a less conventional approach. Implementation resides with investment staff to ultimately choose replacement exposures and, in many cases, to choose the managers that control them. If no leverage constraints are eased, this accommodation can be applied at the total plan level, or within replacement exposure mandates. Tactical discretion is another challenge for setting the proper point of accountability. While a minority of investment staffs are allowed full discretion to enact tactical decisions on timing exposures, most are allowed to delegate to investment managers that are subsequently monitored via the performance measurement and evaluation cycle.

Minor surgery involves more complex exposures and, as the name suggests, it is often reserved for experienced technicians. Winning Board approval to delegate this responsibility to a manager is a much more challenging task for investment staff. Recurrent education of the investment board or other governing body is advised as a way to assure mandate survival until it has performed its stated goal of risk reduction in a market correction. Return characteristics of protective strategies (rather than return maximization strategies) opens them to higher risk of termination. After time passes, investment professionals will turn over, and the memories of why we included more esoteric hedging strategies in the portfolio will fade. Opportunity cost, in terms of lagging behind an unhedged benchmark, or opportunity cost in hindsight, is generally what results in survival risk to these protective mandates.

Catastrophic healthcare coverage discussions generally start at the Board level as strategic concerns may drive a desire to use put options. In cases where options are to be held to a key expiration date, investment staff and the governance structure can generally guide the timing of hedging decisions. The more tactical the decisions become, the more critical their timing. In reality, most Boards need to delegate the timing decision downward in the accountability structure, as infrequent meeting schedules do not allow for enough flexibility to enact and remove hedges with success. As this type of coverage is costly, it is the Board's job to delegate an adequate budget for insurance premiums. With that in place, the timing discretion and scope of individual hedges can be allocated to investment staff for implementation. Advice from a strategic partner can be useful, but a finite number of decision points and a straight-forward instrument (e.g., put options) make this a decision that often sits with the investment staff.

Concluding thoughts

Altering an investment portfolio for better downside risk control is ultimately a joint project with roles for Board, investment staff, strategic advisors and niche mandate managers. There are challenges in making investment decisions that trade expected return maximization for the promise of a better outcome in troubled times. Those challenges do not become easier with time, and continued reminders of why we have chosen this route are required along the way. Ultimately, the portfolio outcome is superior with a cohesive and integrated approach to mitigating drawdowns rather than allowing for the emotional comfort that comes with over-reliance on more costly insurance.

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¹ Value-at-Risk (VaR) – a statistical concept of specifying the confidence level, for instance 95%, to quantify magnitude of a potential drawdown. Conditional Value-at-Risk (CVaR) is a related measure that gives the average value of the subset of outcomes in the specified portion of the tail rather than the cutoff value itself.

² high cost healthcare insurance policies cited as way of shifting compensation expense to previously non-taxable benefit expense. Cadillac name stems from a once iconic US car brand remains a symbol of high quality to many.

³ Tail risks come in many forms and could stem from myriad causes, both foreseen or unforeseen. Due to the risk budgeting of most institutions, we focus on those risk stemming from equity markets, as a material weighting to equity is required to meet key return assumptions of most investors.

⁴ PUT strategy systematically writes monthly put options, with cash valued at the option notional value backing the positions. Shortly after expiration of the previous month's option, a new option is written each month. Over time, consistently written options either win (generate more income than incurred loss or foregone gain at option expiration) or lose relative to an unhedged index, but consistent rules-based option writing is more consistent than writing a single option and either losing or winning to a large extent. This index generates a similar performance pattern to the Buy-Write Index (BXM) by the same provider, but does not require an underlying equity position along with short options.

⁵ A technique of adjusting the risk of a hedged position with futures. This can become necessary as the delta (or sensitivity of an option position to market moves) changes as the market moves in relation to an option's strike price.

⁶ A short strangle is an option structure that creates a short volatility position with a short call and long put at different strikes. This index uses a daily delta hedging methodology to remove residual delta exposure to as market moves. Strangle positions are rolled based on a consistent rule (similar to PUT or BXM), so it functions as an effective alternative beta benchmark for this type of mandate.

⁷ popular benchmark for measuring diversified hedge fund of funds universe. These are active strategies that can often be proxied with cheaper rules based alternative betas.

⁸ Futures-based option replication – is often called a portfolio insurance strategy, and the most common variant is known as Constant Proportion Portfolio Insurance. This topic is covered in more detail in previous article "7 Consideration of hiring a hedging manager".

⁹ measurement of implied volatility level in 1-month options on the S&P 500 index. In recent years, there has been considerable growth in financial instruments (such as futures and options) on the VIX index and the forward curve based upon it.

RELATED READING

Fletcher, T. (2016, March). "7 considerations for establishing a hedging program: Protecting portfolios from downside risks." *Russell Investments Research*.

Maidel, S. (2014, May). "Considerations in volatility trading." *Russell Investments Research*.

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First used: April 2018

RIIS-03395 (04/21)