CBOE - 26th Annual Risk Management Conference

Fundamentals of Options Part Three: **Harvesting Volatility**

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The Big Question

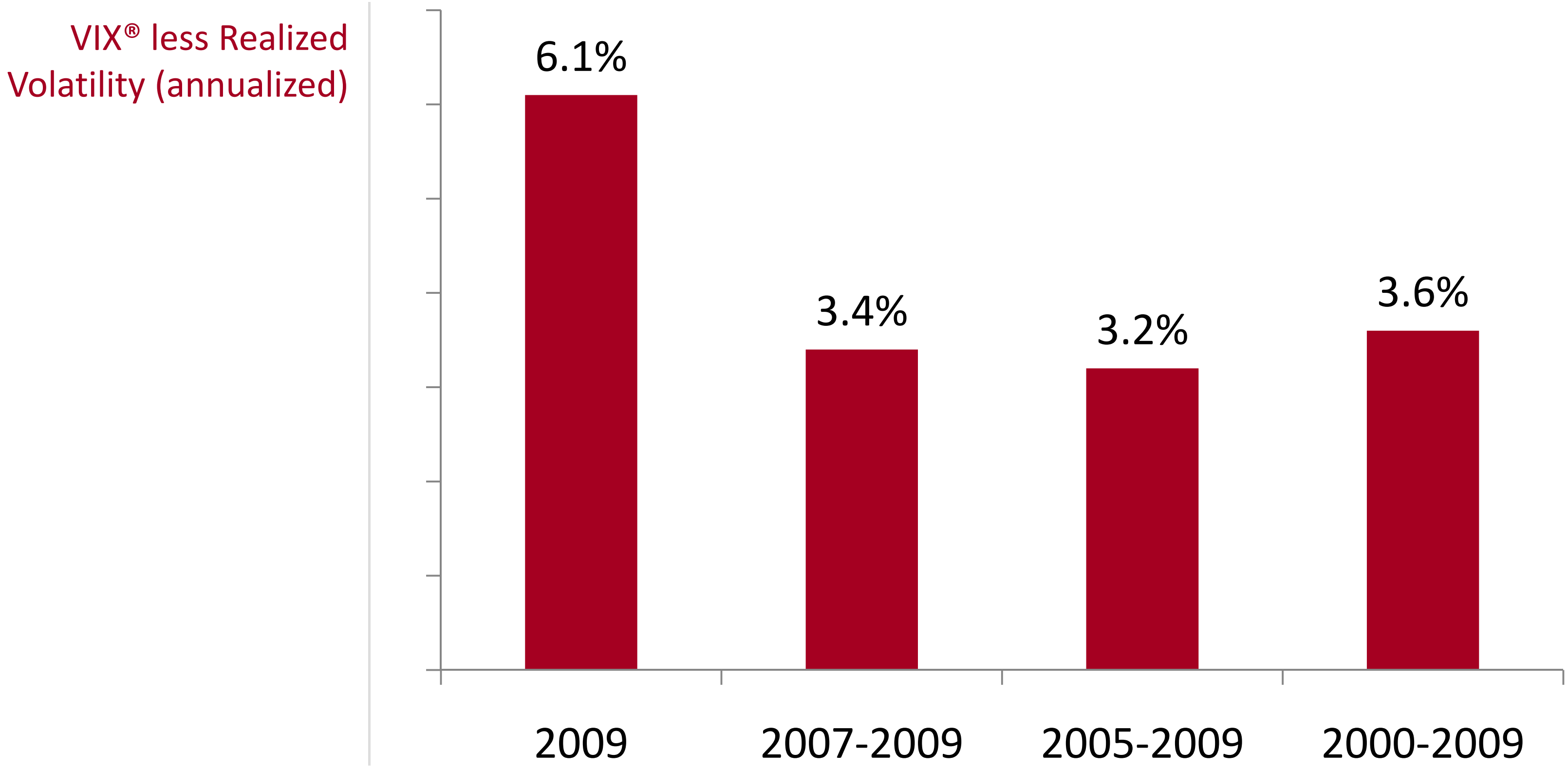
Why are we using an option overlay program?

Strategies to Consider

Option Overlay Strategic Applications:

- Buy-Write Call Selling Program
- Contingent Rebalancing
- Protected Equity Portfolio Allocation
- Tail Risk Hedging

Index Option Valuation



Comment: Historical evidence suggests that index option sellers (puts & calls) earn an above average risk adjusted return. Stated another way, realized index volatility has consistently been below the level implied in option prices.

Source: Goldman Sachs

Contingent Rebalancing – A Simplified Structure

Fund size: $2 billion

Policy Allocation:

- Equity 50%
- Non-Equity 50%

Rebalancing Band: 5%

Comment: The fund intends to rebalance when market exposures move 5% away from target. An alternative rebalancing approach that may be considered is the sale of option strangles, which commits the fund to make equity exposure purchases if the market falls, or equity exposure sales if the market advances, in exchange for option premium income.

Monetizing the Decision to Rebalance

- Use equity index options to contingently rebalance exposure
- Monetize a policy based rebalancing commitment
- Align risk preferences in a more dynamic manner
- Potentially benefit from a short volatility position

Short Strangle: Gain-Loss Profile

Equity Index - Short Strangle Profile

1-Year Term

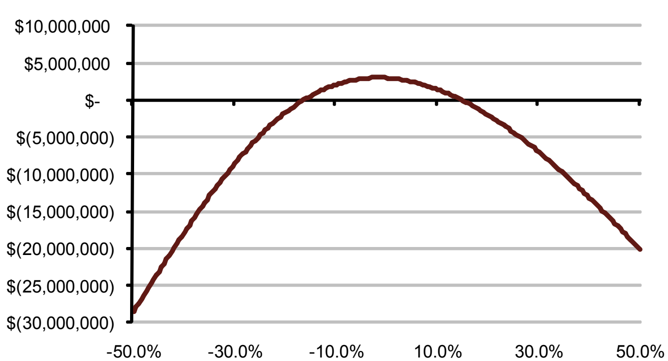
Investment Objective: Selling an option strangle is a means to "monetize" one's intention to purchase equities if they fall or sell equities if they rise. Selling a strangle may be risky and can produce leverage in a portfolio to the extent that collateral is not present to support the short put position.

Equity Index: 1000

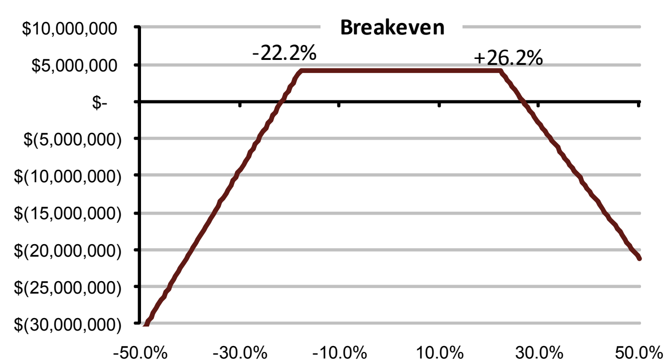
Hedge Term: 1-Year

Structure		Position	Notional	Contracts	Option Type	Strike	Term		Premium	
Short Call:	122.00%	Short	$91,000,000	(910)	Call	1220	1-Year	$	(910,000)	-1.00%
Short Put:	82.00%	Short	$111,000,000	(1110)	Put	820	1-Year	$	(3,330,000)	-3.00%
							Net Premium:	**$**	**(4,240,000)**	

Option Value - Instantaneous



Option Value - at Maturity



Option Value

Costs are based on current market characteristics and assumptions which change over time. The protection levels and costs described are estimates which may not be achieved or achievable, and The Clifton Group makes no guarantee in this regard.

Source: The Clifton Group

Short Strangle: Gain-Loss Profile

Return Estimate at Expiration

Index Return	Contingent Rebalance Option Gain/Loss Versus No Rebalancing		"Delta One" Rebalance Gain/Loss[1] Versus No Rebalancing	
%	%	$		
50.00%	-2.12%	(21,240,000)	-2.55%	(25,480,000)
40.00%	-1.21%	(12,140,000)	-1.64%	(16,380,000)
30.00%	-0.30%	(3,040,000)	-0.73%	(7,280,000)
20.00%	0.42%	4,240,000	0.00%	0
10.00%	0.42%	4,240,000	0.00%	0
0.00%	0.42%	4,240,000	0.00%	0
-10.00%	0.42%	4,240,000	0.00%	0
-20.00%	0.20%	2,020,000	-0.22%	(2,220,000)
-30.00%	-0.91%	(9,080,000)	-1.33%	(13,320,000)
-40.00%	-2.02%	(20,180,000)	-2.44%	(24,420,000)
-50.00%	-3.13%	(31,280,000)	-3.55%	(35,520,000)

1Assumes a lower or upper rebalance band is exceeded only once. Percentage gain/loss values are relative to a $1B underlying portfolio.

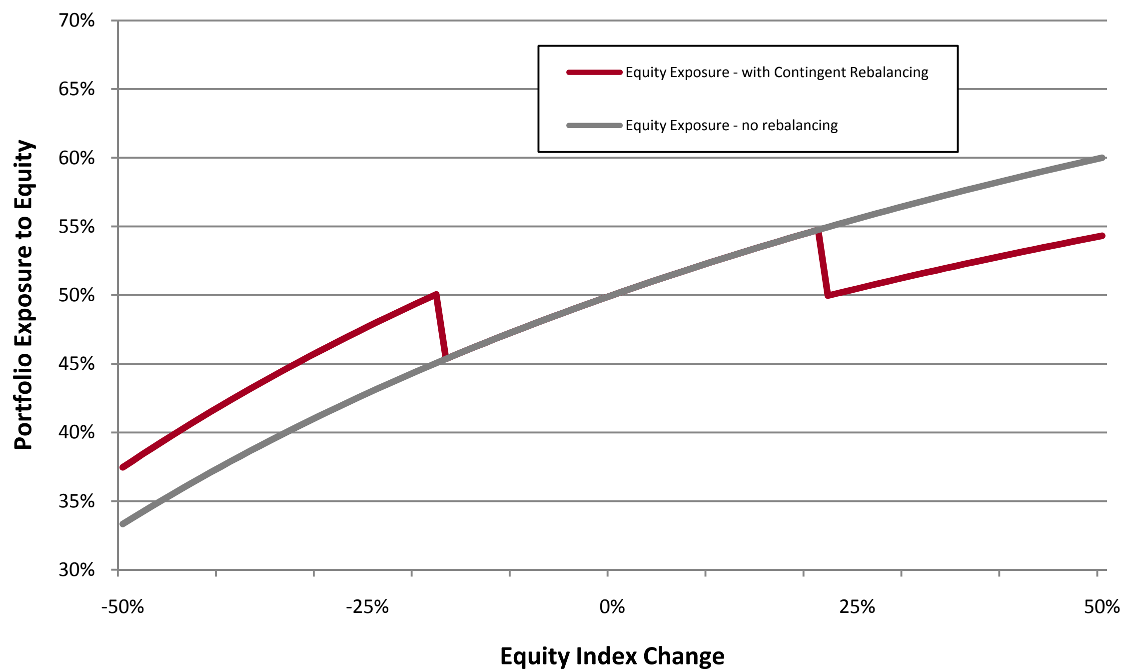
Comment: Using options to rebalance may improve results versus direct rebalancing if the market exhibits a significant move in one direction. Large market reversal periods (e.g. early 2009) tend to favor a "Delta One" direct rebalancing approach as multiple profitable rebalancing moves may be implemented versus one move for contingent rebalancing.

Source: The Clifton Group

Equity Exposure with Options

Term: 1 year forward
Assumption: Non-Equity Portfolio value is unchanged

Portfolio Exposure to Equity



Comment: Contingently rebalancing equity exposure, in many situations, will closely align effective market exposure with targeted exposure following large market moves.

Source: The Clifton Group

Option Based Contingent Rebalancing

Risk Factors to consider:

- Leverage
- Correlation
- Option Pricing
- Opportunity Cost
- Implementation
- Collateral

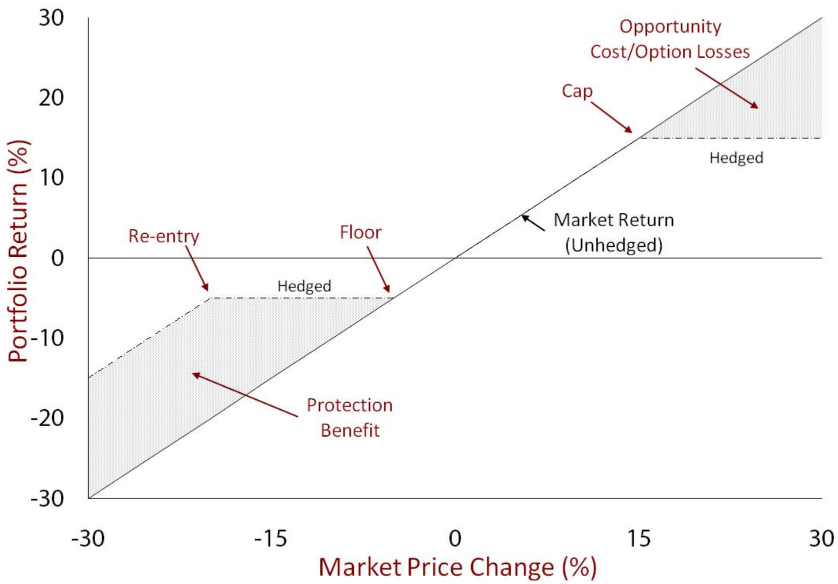
Protected Equity - Portfolio Structure

Long protection floor purchased approximately 5% below initial market level; reentry short put option sold approximately 20% below initial market level; short call option (upside price cap) estimated to normally be 10-20% above initial market level. Objective is to establish Put Spread Collar for zero net premium cost.

Horizon: 1 year

Protective Option Overlay (Put Spread Collar*)

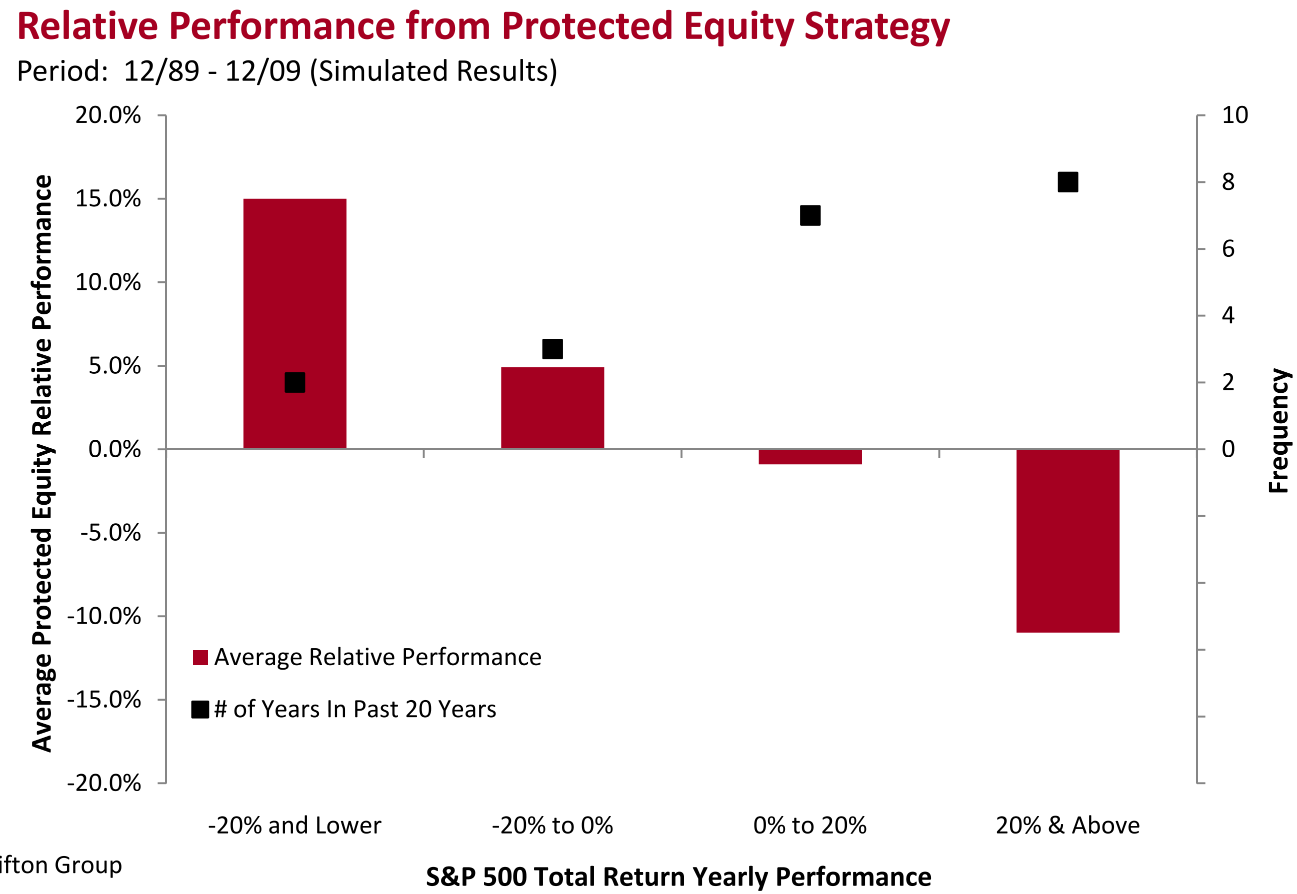
Put Spread Collar



Source: The Clifton Group

The Clifton Group
Investment Management Company

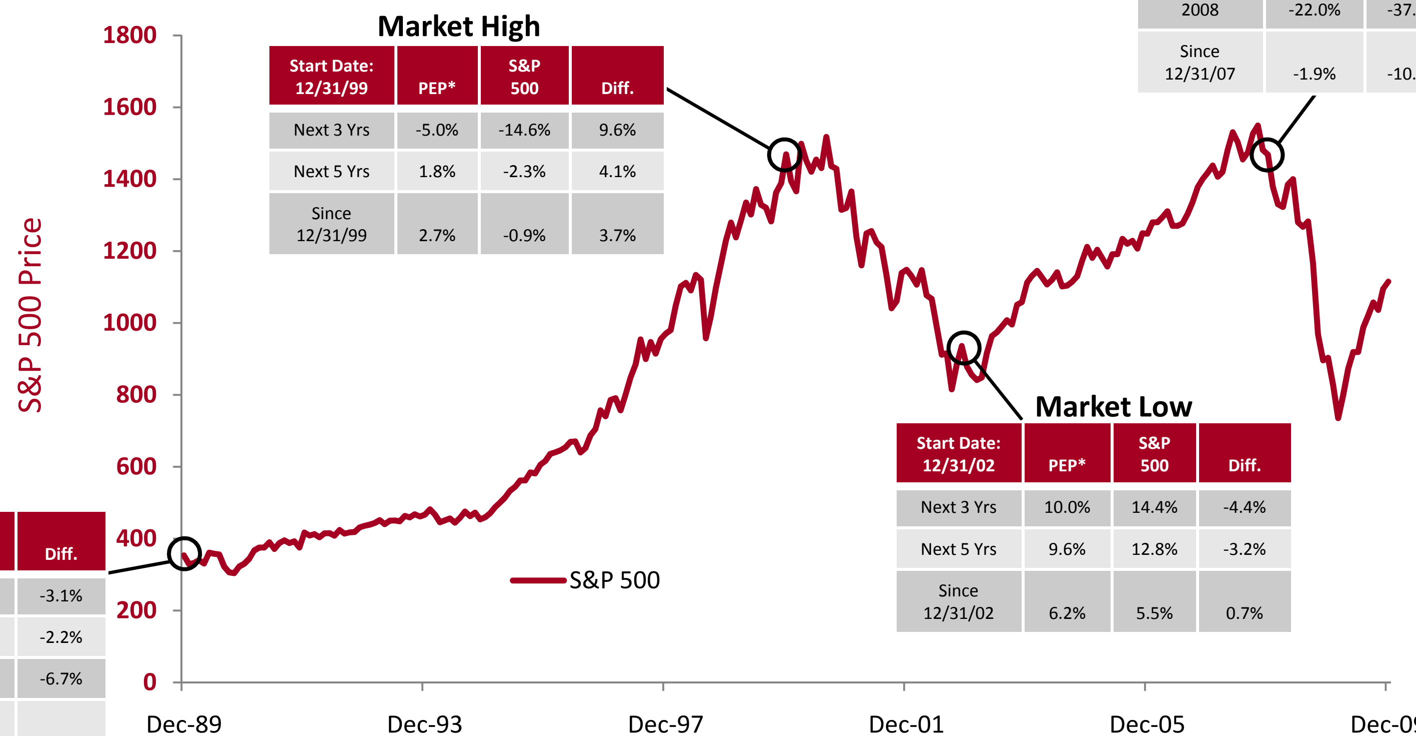
Protected Equity Portfolio Allocation



Source: The Clifton Group

<u>Comment:</u> Historical simulated results show that in 60% of market periods the Protected Equity approach outperformed or came close to matching index results. In 40% of the periods, a very strong market advance produced a meaningful opportunity cost.

Expected Performance from Market Extremes



Recent Turmoil

Start Date: 12/31/07	PEP*	S&P 500	Diff.
2008	-22.0%	-37.0%	15.0%
Since 12/31/07	-1.9%	-10.7%	8.9%

Market High

Start Date: 12/31/99	PEP*	S&P 500	Diff.
Next 3 Yrs	-5.0%	-14.6%	9.6%
Next 5 Yrs	1.8%	-2.3%	4.1%
Since 12/31/99	2.7%	-0.9%	3.7%

Market Low

Start Date: 12/31/02	PEP*	S&P 500	Diff.
Next 3 Yrs	10.0%	14.4%	-4.4%
Next 5 Yrs	9.6%	12.8%	-3.2%
Since 12/31/02	6.2%	5.5%	0.7%

Long Term

Start Date: 12/31/89	PEP*	S&P 500	Diff.
Next 3 Yrs	7.7%	10.8%	-3.1%
Next 5 Yrs	6.5%	8.7%	-2.2%
Next 10 Yrs	11.5%	18.2%	-6.7%
Since 12/31/89	7.0%	8.2%	-1.2%

Source: The Clifton Group

* Protected Equity Portfolio (PEP) performance is simulated based on a hypothetical zero net premium 1 year Put Spread Collar (-5% floor/-20% reentry/solve for cap) established at beginning of each year, in combination with a long position in S&P 500.

Risk/Return History for Protected Equity

A Protected Equity portfolio should produce lower long term returns in exchange for reduced volatility, but may produce more attractive risk-adjusted returns, based on empirical evidence.

	Protected Equity Return*	S&P 500 Total Return	Difference
1990	-1.5%	-3.1%	**1.6%**
1991	18.3%	30.5%	**-12.2%**
1992	7.4%	7.6%	**-0.2%**
1993	9.2%	10.1%	**-0.9%**
1994	0.4%	1.3%	**-0.9%**
1995	15.4%	37.6%	**-22.2%**
1996	12.9%	23.0%	**-10.1%**
1997	15.8%	33.4%	**-17.6%**
1998	18.7%	28.6%	**-9.9%**
1999	21.0%	21.0%	**0.0%**
2000	-4.0%	-9.1%	**5.1%**
2001	-3.8%	-11.9%	**8.0%**
2002	-7.1%	-22.1%	**15.0%**
2003	15.8%	28.7%	**-12.9%**
2004	10.0%	10.9%	**-0.9%**
2005	4.6%	4.9%	**-0.4%**
2006	12.8%	15.8%	**-3.0%**
2007	5.5%	5.5%	**0.0%**
2008	-22.0%	-37.0%	**15.0%**
2009	23.5%	26.5%	**-3.0%**

	Summary Statistics		
	Protected Equity	S&P 500	Difference
Total Returns			
Last 5 years	3.7%	0.4%	3.3%
Last 10 Years	2.7%	-0.9%	3.7%
Last 20 Years	7.0%	8.2%	-1.2%
Standard Deviation[1]			
Last 5 years	15.0%	21.6%	-6.5%
Last 10 Years	12.5%	20.0%	-7.6%
Last 20 Years	11.0%	19.2%	-8.2%
Sharpe Ratio			
Last 5 years	0.05	-0.12	0.17
Last 10 Years	-0.02	-0.20	0.17
Last 20 Years	0.26	0.21	0.05

[1] Standard Deviation calculation based on annual returns

* Simulated results based on a hypothetical zero net premium 1 year Put Spread Collar (-5% floor/-20% reentry/solve for cap) established at beginning of each year, in combination with a long position in S&P 500. Option price information provided by Market Data Express.

Source: The Clifton Group

Protected Equity Diversification

- A portfolio allocation which delivers added diversification
- Contingent rebalancing “Married” to protection
- Right side of the volatility trade – historically
- Disciplined implementation process removes need for market timing

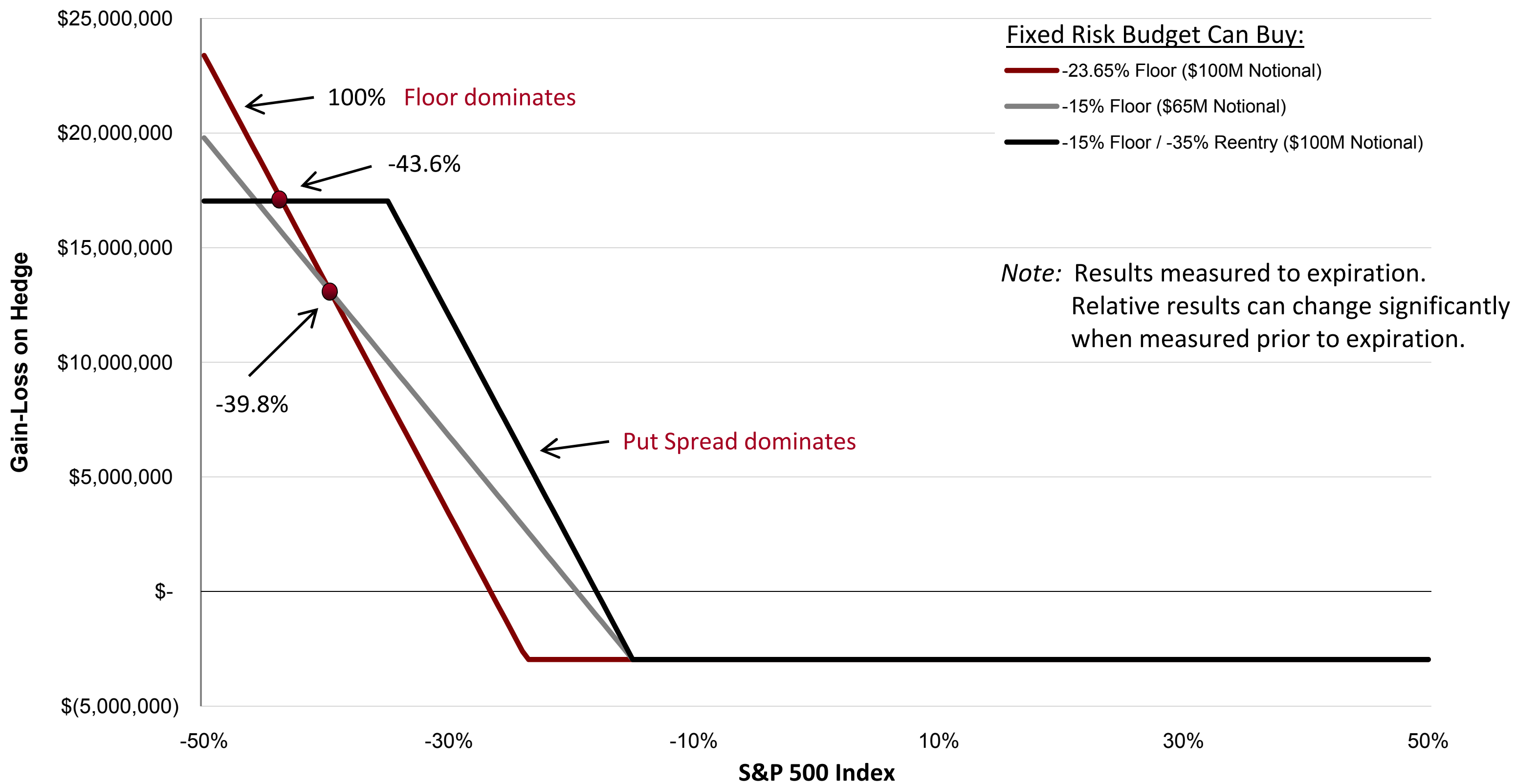
Tail Risk Hedging

- Designate a “disaster” risk management budget
- Select a risk management approach
- Implement in a disciplined manner

Risk Budget Allocation Alternatives

An investor can spend a designated risk budget to gain full protection (100% notional coverage), partial protection (65% notional coverage), or limited protection (put spread).

S&P 500 Hedges - Gain/Loss Comparison



Comment: The example above assumes an investor had a fixed risk budget (e.g. 3.00% of assets) which could be spent on one of three distinct structures.

Source: The Clifton Group

Equity Insurance – Relative Cost

Term: One Year

Strike	S&P 500 Index Put Option Premium -30%	-20%	-10%	0%
Market Price	1.6%	3.0%	5.3%	8.9%
At-The-Money Constant Implied Volatility (e.g. 21.2%)	0.4%	1.6%	4.3%	8.9%
Difference	1.2%	1.4%	1.0%	0.0%
Market Price Implied Volatility	30.6%	27.3%	24.2%	21.2%

Comment: "Tail hedge" option costs have historically been priced at much higher implied volatility levels than higher strike options.

Source: The Clifton Group

Tail Risk Hedging

- Committing to a tail risk event budget
- Evaluation of hedge structure alternatives
- Wrong side of volatility - historically
- A hard to quantify tail hedge payoff

Costs and Risks

Risks

Tracking Error Risk: Mismatch between the Client's investment manager performance and the behavior of the hedge instrument index upon which the options hedging strategy is based

Credit Quality and Liquidity Risk: Counterparty credit risk on OTC trading and Client's ability to make payments required on a timely basis

Leverage Risk: Creation of market exposure in excess of underlying collateral value may lead to significant capital losses and result in position liquidation.

Trade Restrictions Risk: Trading halt or other suspension of trading, whether or not temporary in nature, may limit Clifton's ability to implement Client-directed protection modifications

Margin Collateral Risk: Cash collateral may be needed to maintain option positions when initiated and over time. Failure to satisfy margin needs may lead to forced position liquidation

Early Termination Risk: Early termination of the protection program may produce results meaningfully different from Client return objectives