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Tail Hedging: Mitigate Draw Downs, Higher Risk Premium, Lower Volatility

- Tail risk frequency and severity are often underestimated using traditional methods.
- Managing tail risk and avoiding large losses is critical to long term wealth creation.
- Traditional methods of hedging tail risk are expensive and may have limited effectiveness.
- Innovative tail risk hedging techniques may help:
  - Lower overall portfolio risk and mitigate tail risk
  - Protect portfolios against increased tail correlations (diversification failure)
- Tail risk hedging should be an integral part of asset allocation.

What Is a Tail Hedge?

- Technical Definition: A Tail Hedge strategy is designed to buffer a portfolio during a 3-standard deviation market event.
- Practical Definition: A Tail Hedge Strategy is like an umbrella…you want to own one before it rains.
Traditional Portfolios Are Not Diversified By Risk

12-Month 99%VaR of a 60/40 Portfolio = 23.6%
January 1988–December 2011

Common Diversified Portfolio

- Fixed Income 40%
- Equity 60%

Source of VaR

- Equity 96.8%

The Challenge:
60% of the Allocation = 96.8% of the Risk

- Curve 0.8%
- Swap Spreads 0.0%
- Spread Credit and EMG 1.7%
- Spread Securitized 0.4%

Analysis for the period January 1988–December 2011

60/40 Portfolio Drawdown vs SPX Drawdowns

Correlation: 88%

60/40 portfolio is 60% SPX/40% Barclays US AGG Index from 1976. Prior to 1976, it is 60% SPX/40% US10yr Note
High Yield vs Equity Drawdowns

Correlation: 82%

Core + Fixed Income Managers = Long Beta (Credit) = Long Tail Risk

Correlation: (90)%

Long Credit = Short Volatility

Market Structure: Asset Tail Dependence is higher than Beta Implied

Data from February 1988-October 2010
**Statistics vs Reality:** Tail Events Occur More Frequently Than Expected

In a normal distribution, a negative tail event should have occurred on about 28 days since 1928. In reality, extreme losses occurred about seven times as often, on 198 days.


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**Hedge Fund Return Profiles: Short Volatility, Liquidity and/or Correlation**

Hedge Fund vs. SPX Monthly Returns

VIX Distribution = Attractive Tail Hedge Profile, But Too Costly

Data: 1/1997 - 12/2010

Traditional Methods of Hedging are Expensive and May Have Marginal Impact

<table>
<thead>
<tr>
<th>Im Delta 25 Put/Call</th>
<th>Strike</th>
<th>Moneyness</th>
<th>Imo Cost</th>
<th>Annual Cost</th>
<th>Annual Breakeven</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;P 500 Put</td>
<td>1185</td>
<td>-7.21%</td>
<td>198bps</td>
<td>792bps</td>
<td>-45.13%</td>
</tr>
<tr>
<td>VIX Call</td>
<td>37.5</td>
<td>39.93%</td>
<td>578bps</td>
<td>2312bps</td>
<td>63.05%</td>
</tr>
<tr>
<td>Receiver On US 10yr Rates</td>
<td>1.9</td>
<td>27bps</td>
<td>70bps</td>
<td>280bps</td>
<td>-49bps</td>
</tr>
<tr>
<td>CDX IG Payer</td>
<td>160</td>
<td>42bps</td>
<td>27.5bps</td>
<td>110bps</td>
<td>67bps</td>
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<tr>
<td>Brazilian Real Put</td>
<td>2.03</td>
<td>8.80%</td>
<td>161bps</td>
<td>644bps</td>
<td>-15.24%</td>
</tr>
</tbody>
</table>

*Annual breakeven is the movement required (in % or in bps) in the underlying in order for the hedge to breakeven.

As of January 3, 2012
Tail Hedging Process

Objective: seek cost-effective tail-risk hedging opportunities across multiple asset classes

- Seek to be long volatility (and liquidity/correlation)
- Identify the most efficient tail hedges (cost vs payout)
- Diversify hedges across asset classes and structures, including indirect or non-traditional hedges that provide long volatility exposure
  - Interest rates / yield curve
  - Currencies
  - Credit
  - Equity
- Actively manage the strategy

As of July, 2012
There can be no assurance fund objectives will be achieved.

Volatility Correlated Across Asset Classes
Diverse Range of Hedging Choices

- **Equities**: Option strategies in global equity markets are just one way to hedge tail risk.

- **Volatility**: The market has evolved to allow investors to implement strategies based on market volatility such as options on the VIX index.

- **Rates**: Duration and exposure to ‘risk-free’ assets may serve investors well in periods of market stress. Yield curve strategies (ie curve flatteners) may also help.

- **Sovereign**: Relative value opportunities in sovereign credit risk can offer attractive cost-efficient tail hedging.

- **Credit**: Credit and credit derivatives can offer compelling payout profiles in tail hedging. Credit strategies can span CDS to default protection on credit tranches.

- **Currency**: As one of the most liquid markets in the world, currency strategies can provide effective and efficient tail hedge strategies including ‘anti-carry’ trades.

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**Objective: Seek Cost Effective Tail Risk hedging Opportunities Across Multiple Asset Classes**

Seeks to provide large payoff in the tail (>3 Std), while minimizing hedge costs in calm/rising markets.

Simulation assumes hedge of selling 1x delta 25, 3 month options, buying 2x delta 12.5, 3 month options, rolling both monthly. Underlying asset classes assumed are VIX calls, AUD/JPY puts, AUD/USD puts and receivers on 10yr USD swaps, weighted by volatility.

As of August, 2012
There can be no assurances fund objectives will be achieved.
Tail Hedge Structure Can Provide Significant Advantages

Simulation assumes hedge of selling 1x delta 25, 3 month options, buying 2x delta 12.5, 3 month options, rolling both monthly. Underlying asset classes utilized are Vix calls, AUD/JPY puts, AUD/USD puts and receivers on 10yr USD swaps, weighted by volatility.

Objective: Seek Cost Effective Tail Risk hedging Opportunities Across Multiple Asset Classes …..2yr USD Swap Spreads
.....US Curves

.....Credit=> Long Volatility and Correlation
.....Brazil, Mexico CDS

.....FX => Short AUD, Long CAD (inverted)
Implementation and Challenges

- Implementation
  - Internal
    - Resources/expertise
  - Fund
    - Limited track records
    - Range of strategies

- Challenges
  - Basis Risk
  - Counterparty Risk

Summary

- Mitigating large drawdowns is critical to investment success
- Asset class based allocation/diversification is not sufficient
- Innovative tail risk hedging strategies can provide downside protection at reasonable cost
- Tail risk hedging should become an integral part of the asset allocation decision
Appendix

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