

# ALMA

## Extreme Events and Worst-Case Losses

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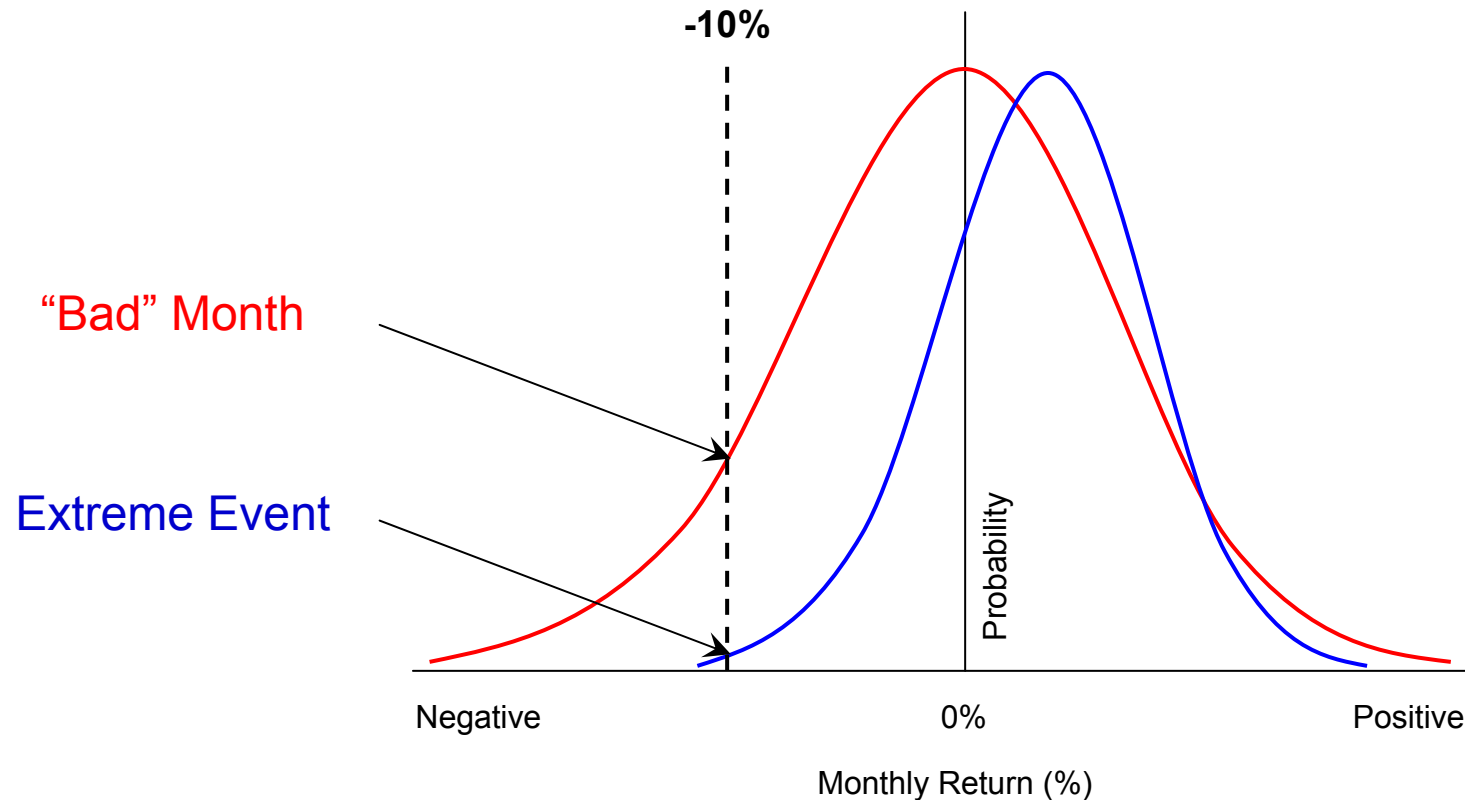
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KEY ASSET MANAGEMENT

# Extreme Events and Worst-Case Losses

- The Anatomy of Extreme Events
- Extreme Events in Recent Times
- How often should these Events occur?
- Why and how do they occur?
- Protecting yourself from the effects of Extreme Events
- Summary

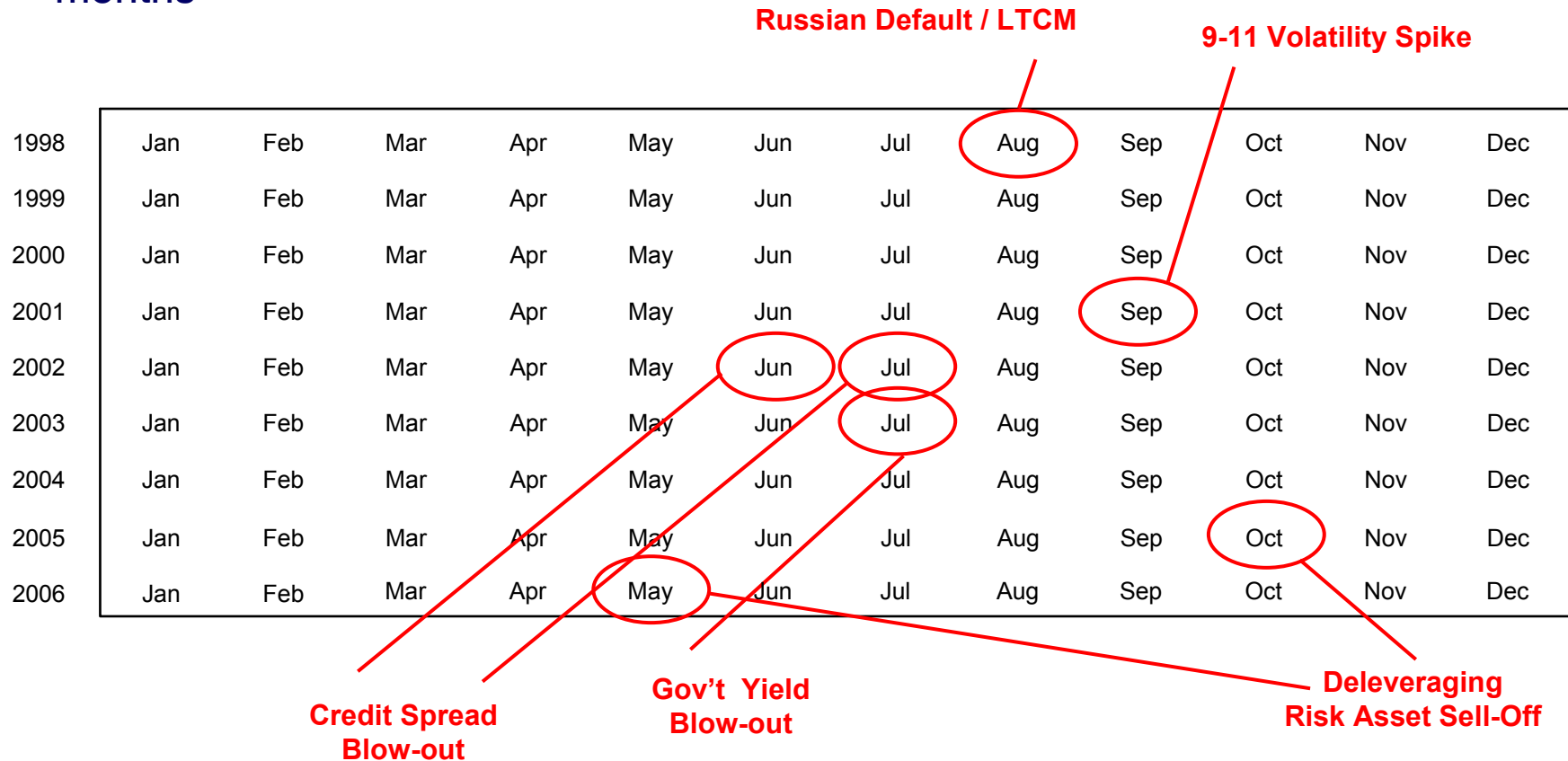
# The Anatomy of Extreme Events

- By their very nature Extreme Events are unexpected events
  - They do not occur frequently, and are unpredictable in their timing
- A big loss does not always constitute an extreme event



# Extreme Events in Recent Times

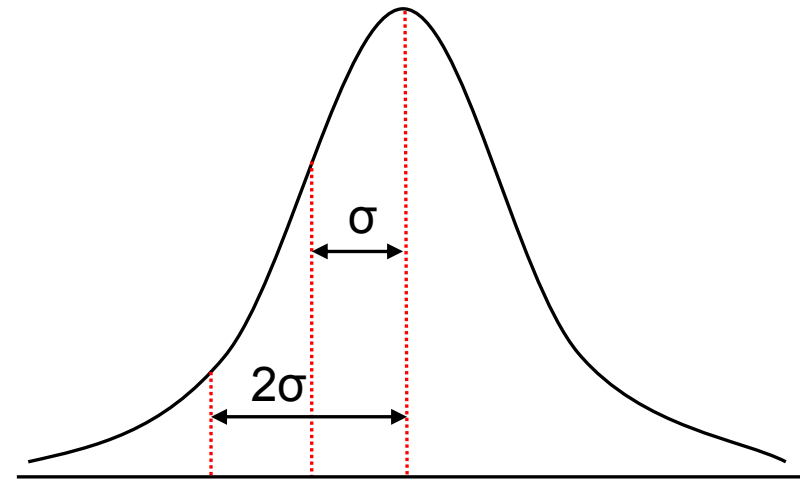
- Extreme Events are typically defined at the 97.5% Confidence Interval i.e. 1 in 40 months



- The last 108 observations have yielded 7 Extreme Events - 1 every 15 -16 months
- Clearly these rare events are more frequent than expected - Why?

# How often should these Events occur?

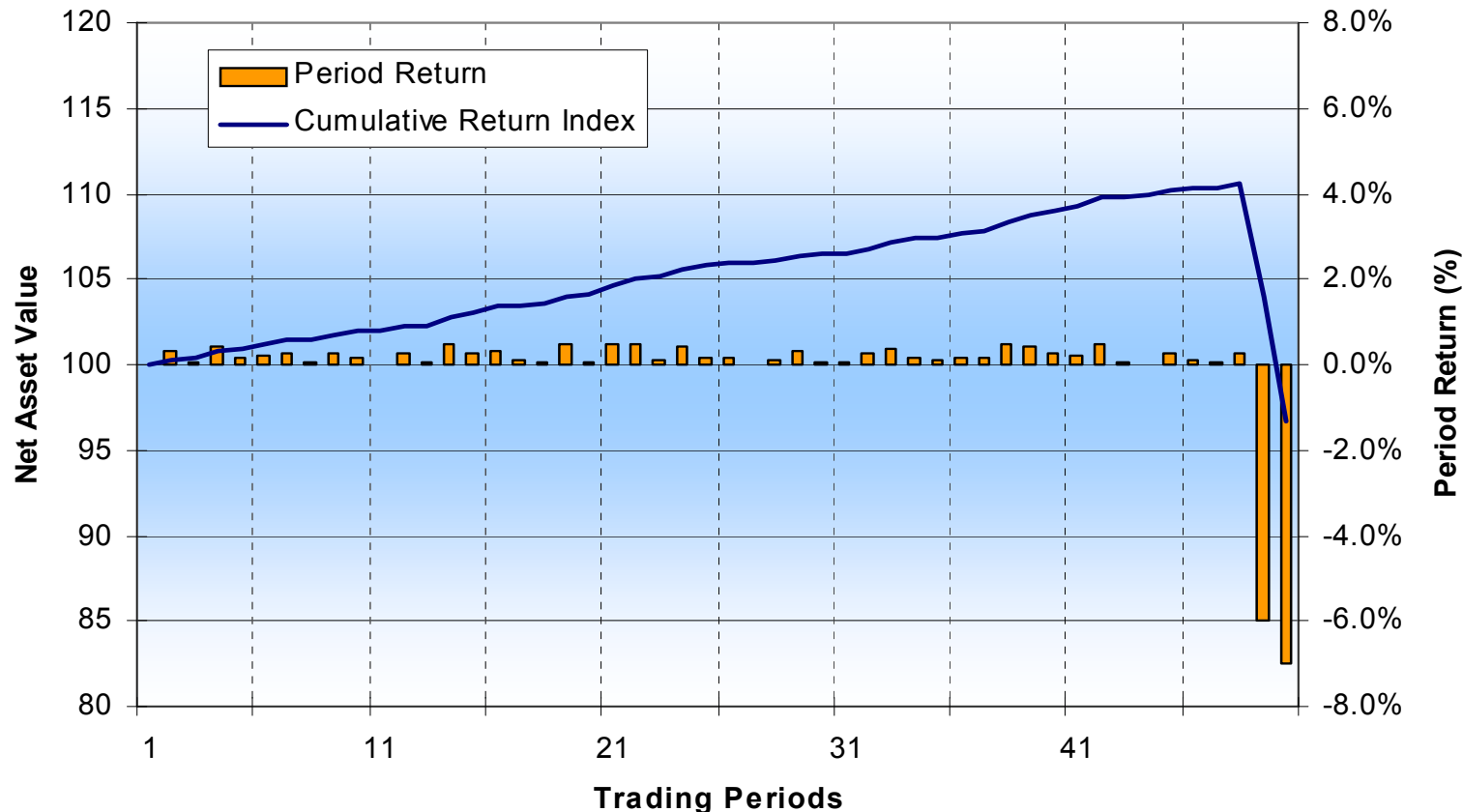
Limit (Std. Deviation)	Probability of Event > Limit	Frequency of Event
$\sigma$	31.73%	1 in 3
$2\sigma$	4.55%	1 in 22
$3\sigma$	0.01%	1 in 370
$8\sigma$	~ 0.00%	1 in 800 million million



- Normal distributions / Historic returns underestimate risk
  - Especially in the downside tail
  - Worst-case losses are always in the future
- Such rare events do occur, and can occur in quick succession
  - Path-dependent effects more apparent in hedge fund returns

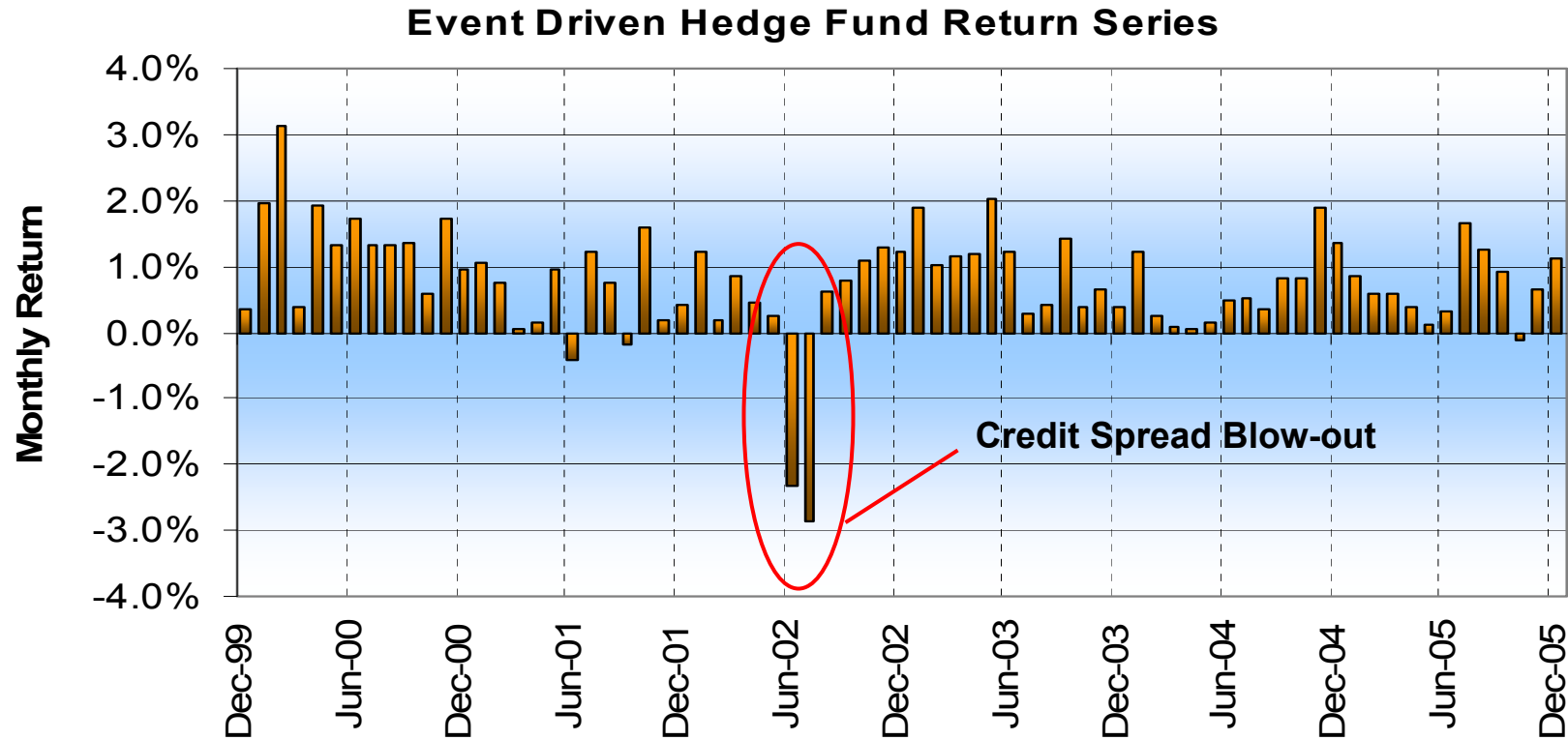
# Why and how do Extreme Events occur? - Theoretical example

- Write out-of-the-money call options - collect the premiums
- Strategy will lose significantly when markets rise rapidly - option payout



- Historic risk is minimal, however potential risk is large
- Short volatility strategy - Extreme Event driven by rising markets

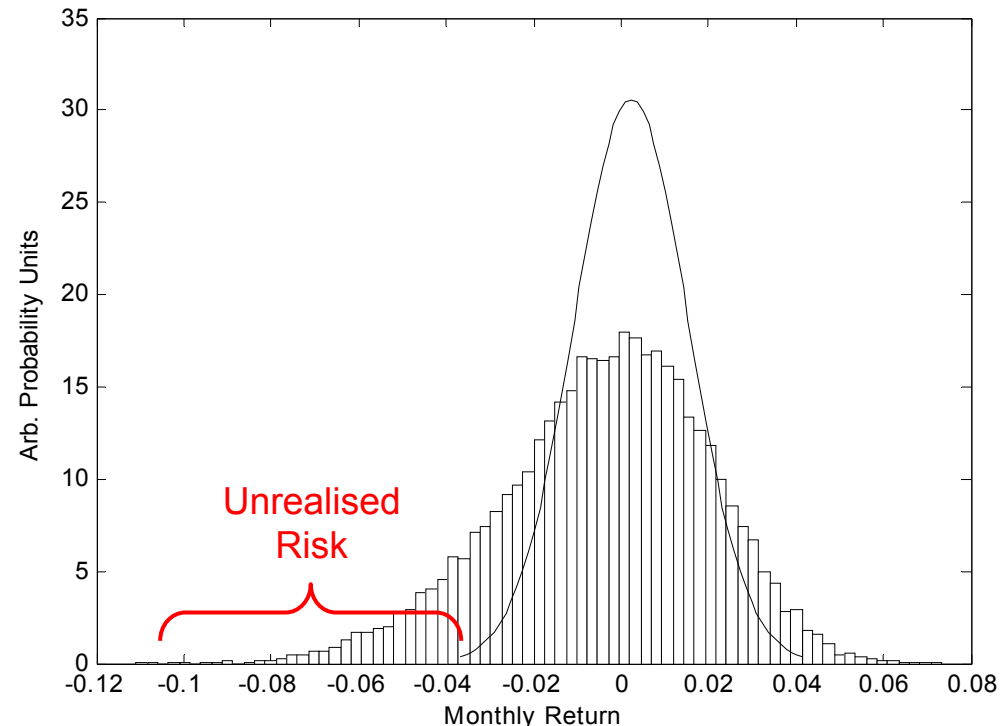
# Why and how do Extreme Events occur? - Actual example



- Extreme Events have a very rapid onset - paradigm shift
- Often catalyst-driven or path dependent
- Extreme Events for HF strategies are often mark-to-market, and can be ridden out
- Extreme Events can be great buying opportunities!

# Protecting yourself from the effects of Extreme Events

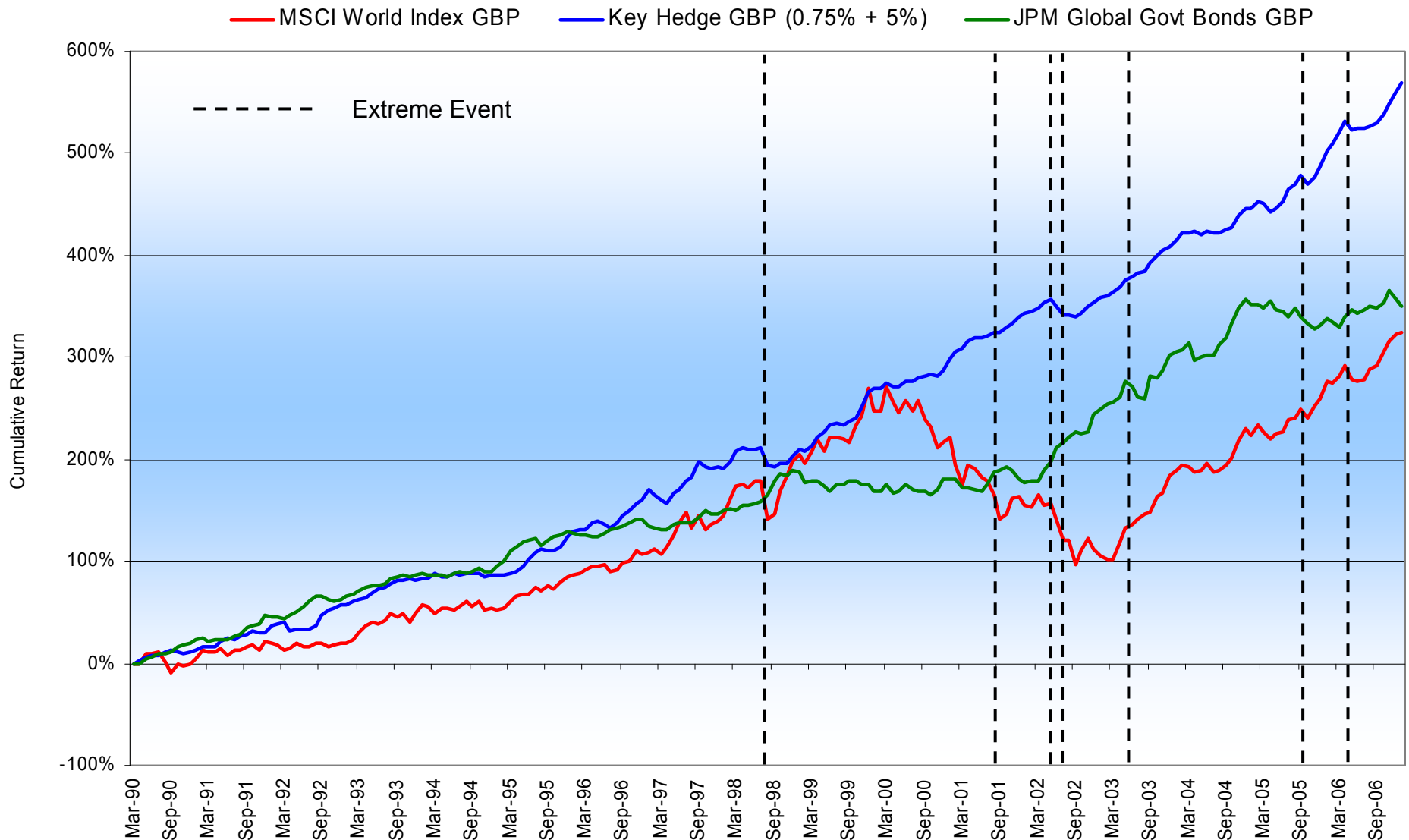
- Identifying and understanding tail risk is the bedrock for avoiding Extreme Events
- Risk must be taken to ensure better than risk-free return, but:



- Ensure managers are taking risks they have expertise in
- Employ Diversified portfolios, by both Strategy and Manager
- Don't rely on naïve diversification
- Target suitable risk-return levels
- Use forward-looking, non-parametric risk management tools
- Consider future potential worst-case scenarios

Implied risk profile (bars) mapped onto the historic return profile (line), highlighting the potential for Extreme Events beyond historic scope.

# Key Hedge: Behaviour in Extreme Events



# Summary

- We have seen that Extreme Events occur both frequently and unexpectedly
- We have shown that Extreme Events need not mean huge loss and vice versa
- There is no avoiding the unexpected, but risk management techniques can be employed to minimise potential losses.
- Hedge Fund-of-Funds provide the appropriate investment and risk management techniques and expertise to maintain robust, well diversified portfolio

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