

2015 Swiss Institutional Investors Conference

Investments – Workshop 7

A Robust Approach to Volatility Trading

Alexandre Capez

Managing Director, Head of Quantitative Risk Strategies
Investment Banking
Credit Suisse

A Robust Approach to Volatility Trading

This material is solely directed at Professional Clients and Eligible Counterparties as defined by the FCA, and is not directed at, and should not be relied upon by, Retail Clients.

Alexandre Capez

16th September 2015

Wider Spectrum of Volatility Instruments Over the Years

1970 - 1990

- Listed Options started trading in 1973
- Isolating the volatility exposure from option positions requires daily delta-hedging
- Path-dependency of volatility exposure (volatility exposure of an option is not constant)

1990s

- Variance Swaps began trading in the OTC market
- Isolate pure exposure to volatility (more specifically, to variance)
- Provide exposure to realised or implied volatility (through forward variance swaps)

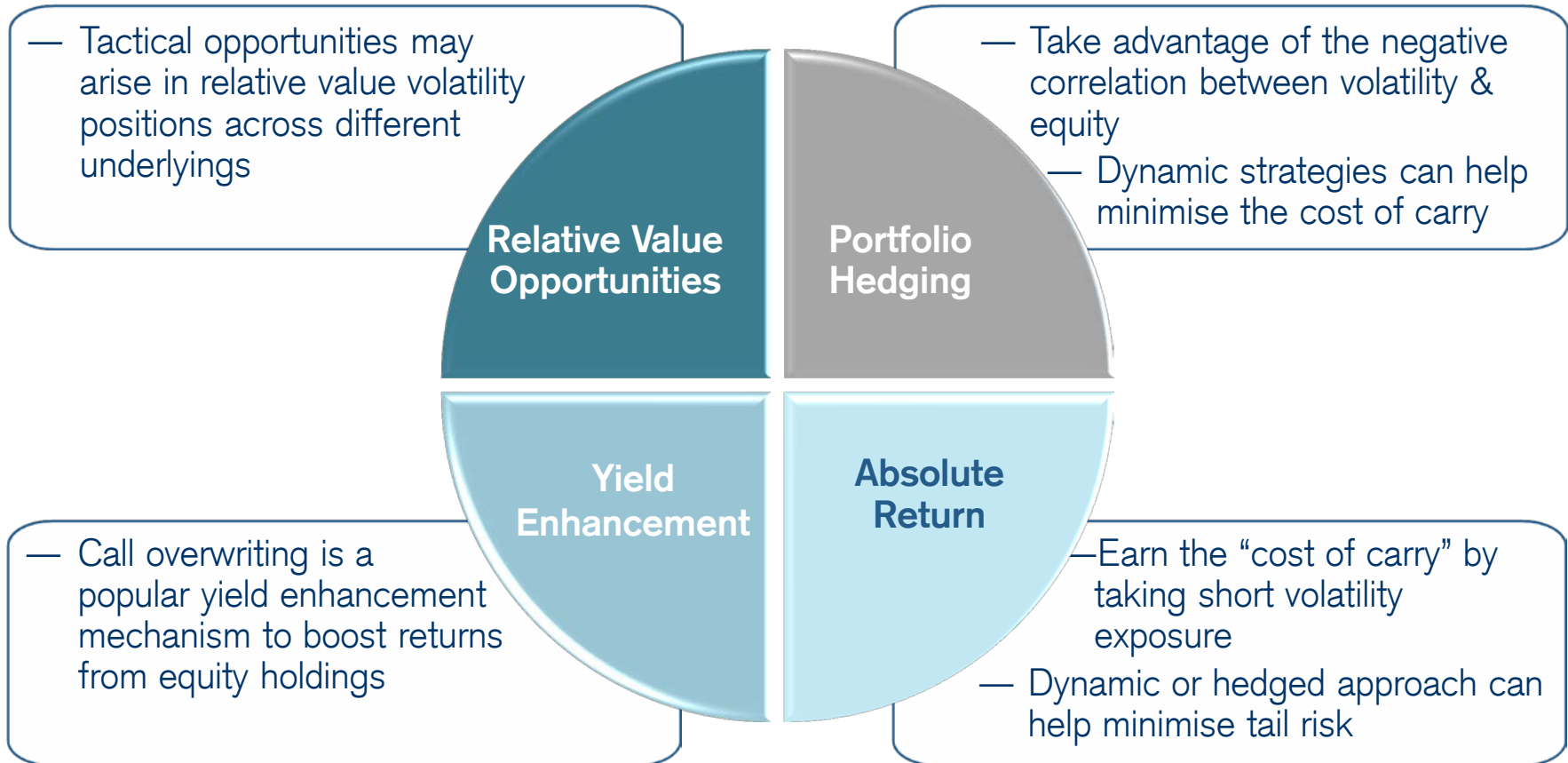
2000s

- VIX & VSTOXX Futures & Options began trading
- Traded as listed instruments on the exchange
- Provide exposure only to implied volatility

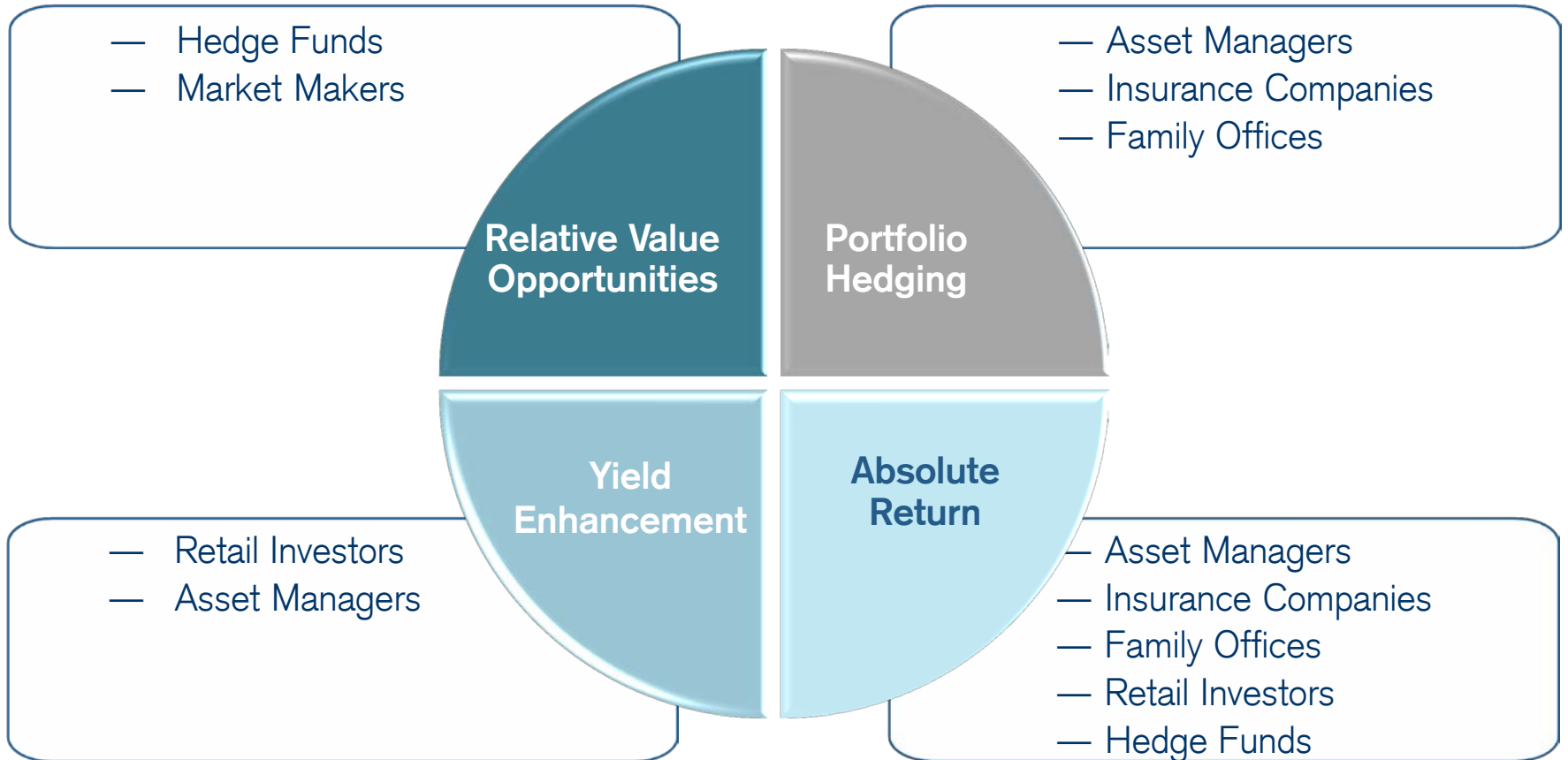
Typography of Investors

Which Purpose Trading Volatility For?

Volatility trading is commonly used to achieve a variety of portfolio solutions:



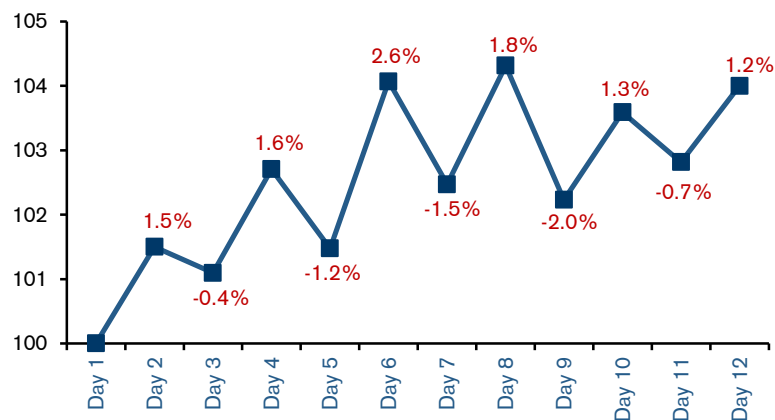
Who Trades Volatility?



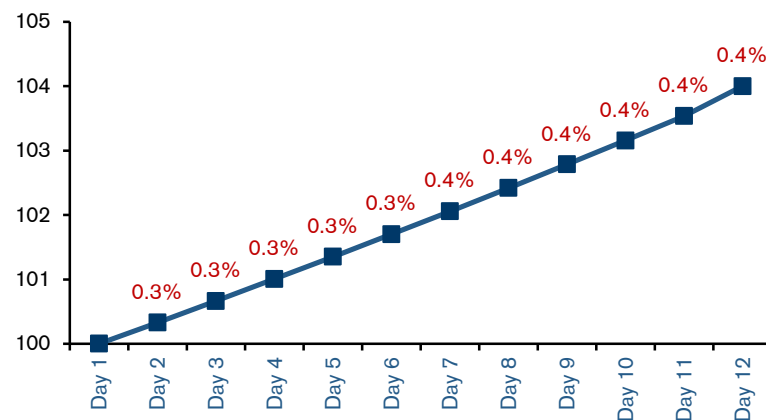
Volatility Properties at a Glance

Realised Volatility → Backward Looking

- **Realised Volatility** is an objective, formulaic measure of historical market risk
 - Represents the standard deviation of returns over a given period
 - Volatility is typically expressed as an annualised figure



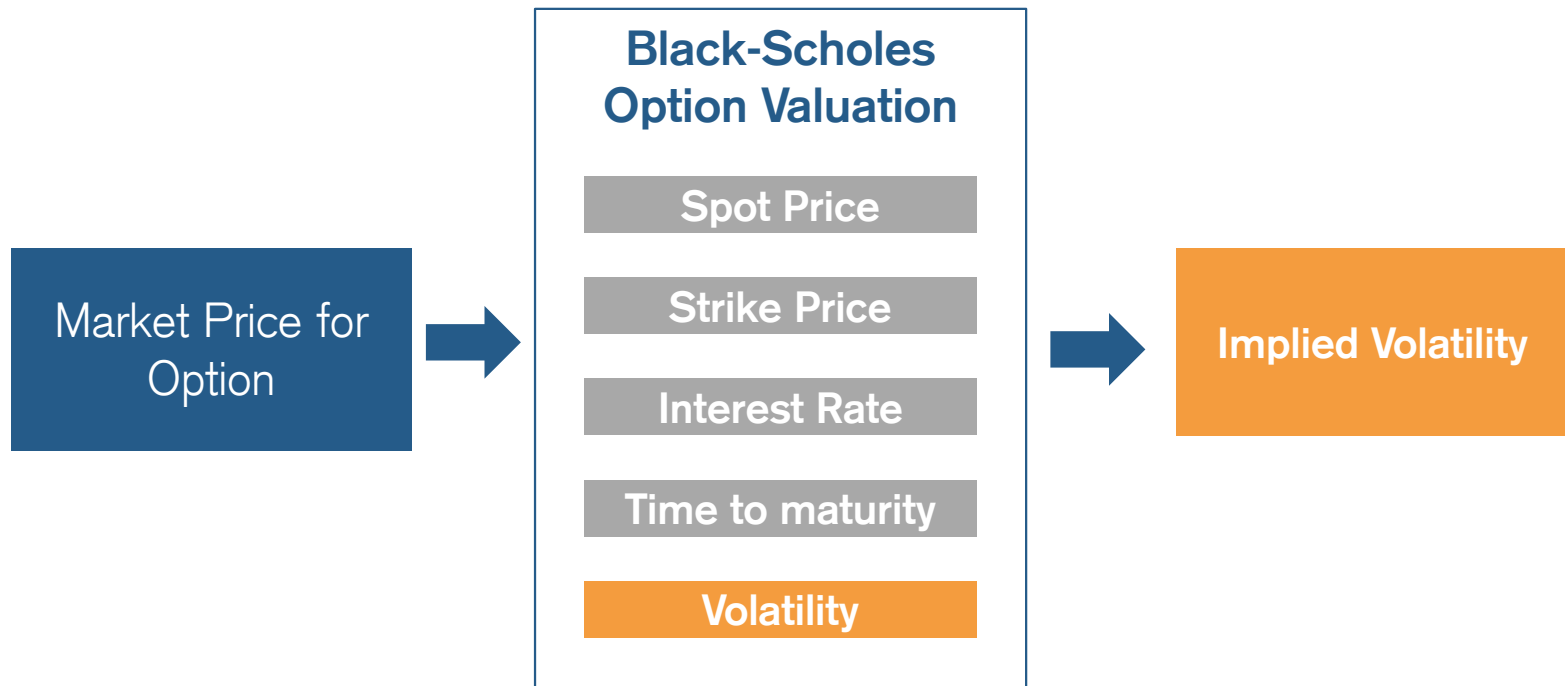
Volatility: 24.4%



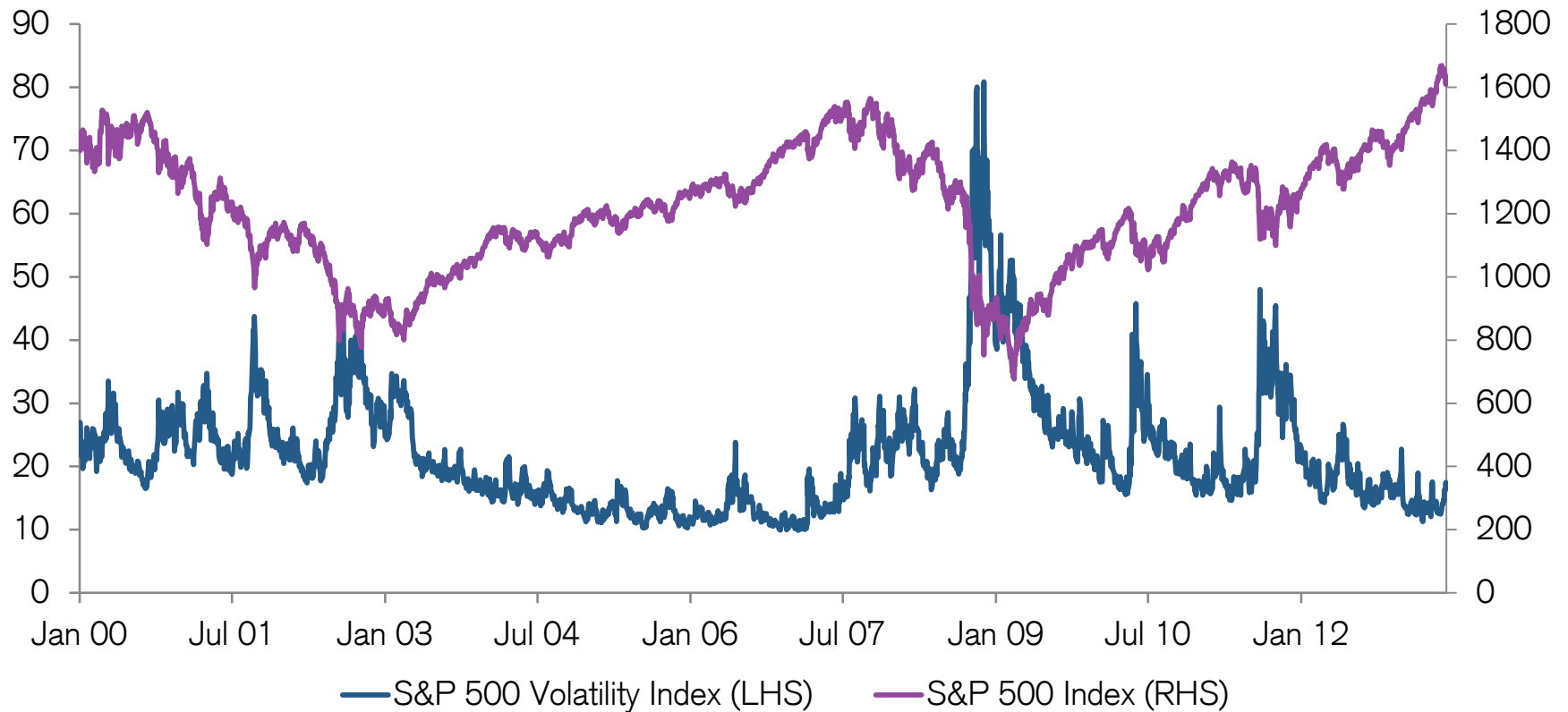
Volatility: 5.7%

Implied Volatility → Forward Looking

- **Implied Volatility** is a subjective measure derived from the market price of options
 - Influenced by demand and supply of options
 - Can be seen as a measure of market sentiment or perceived risk

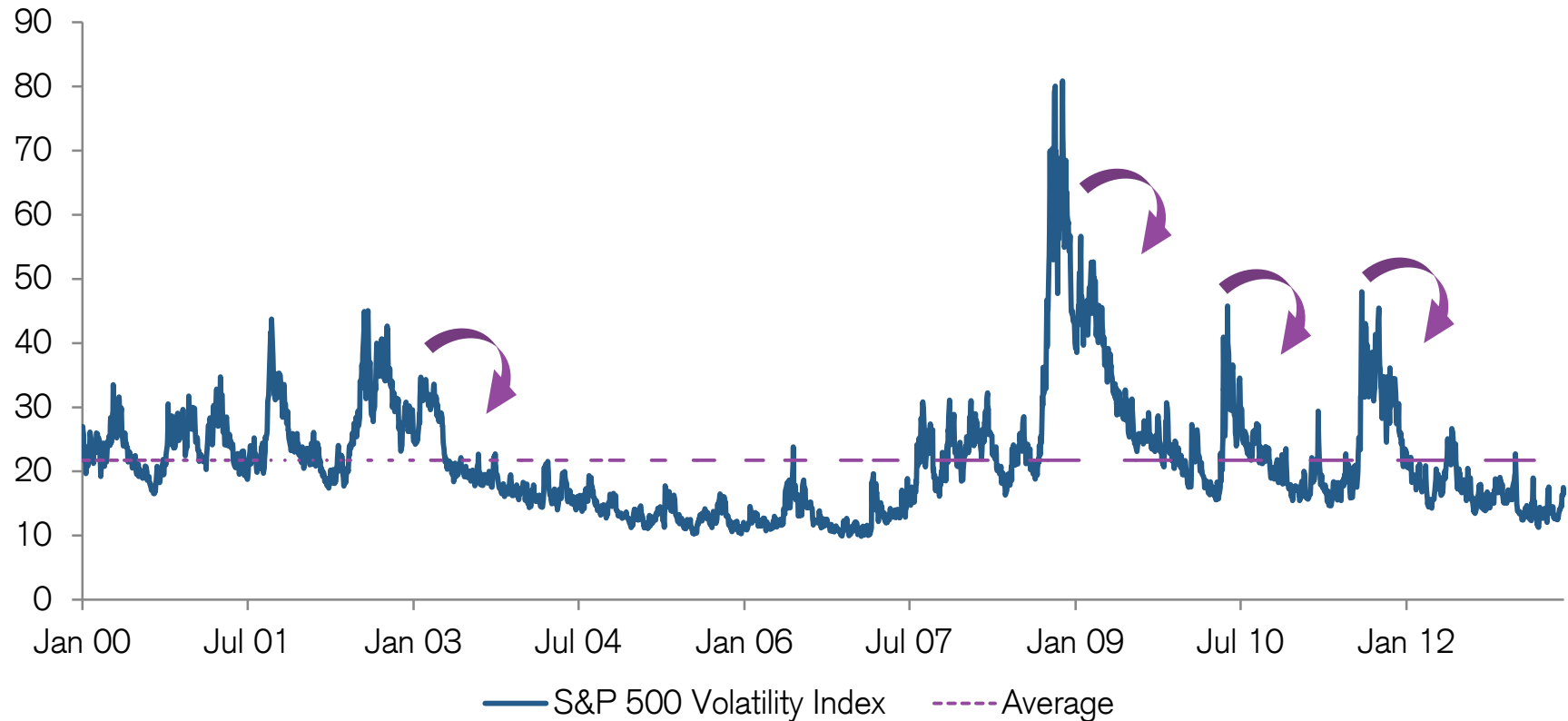


Negative Correlation with Equities



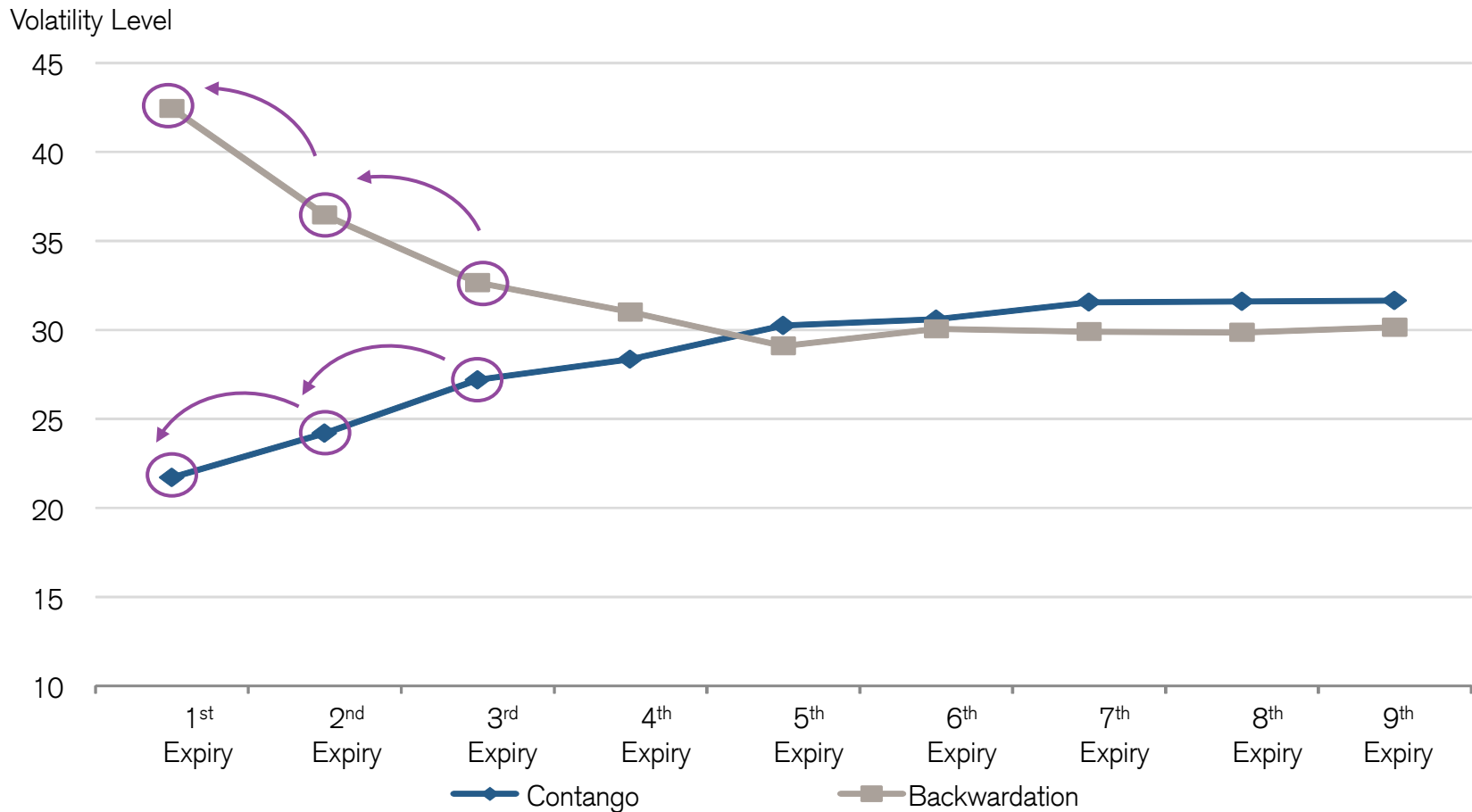
Source: Credit Suisse & Bloomberg (Data from Jan 2000 – June 2013)

Mean Reverting Behaviour



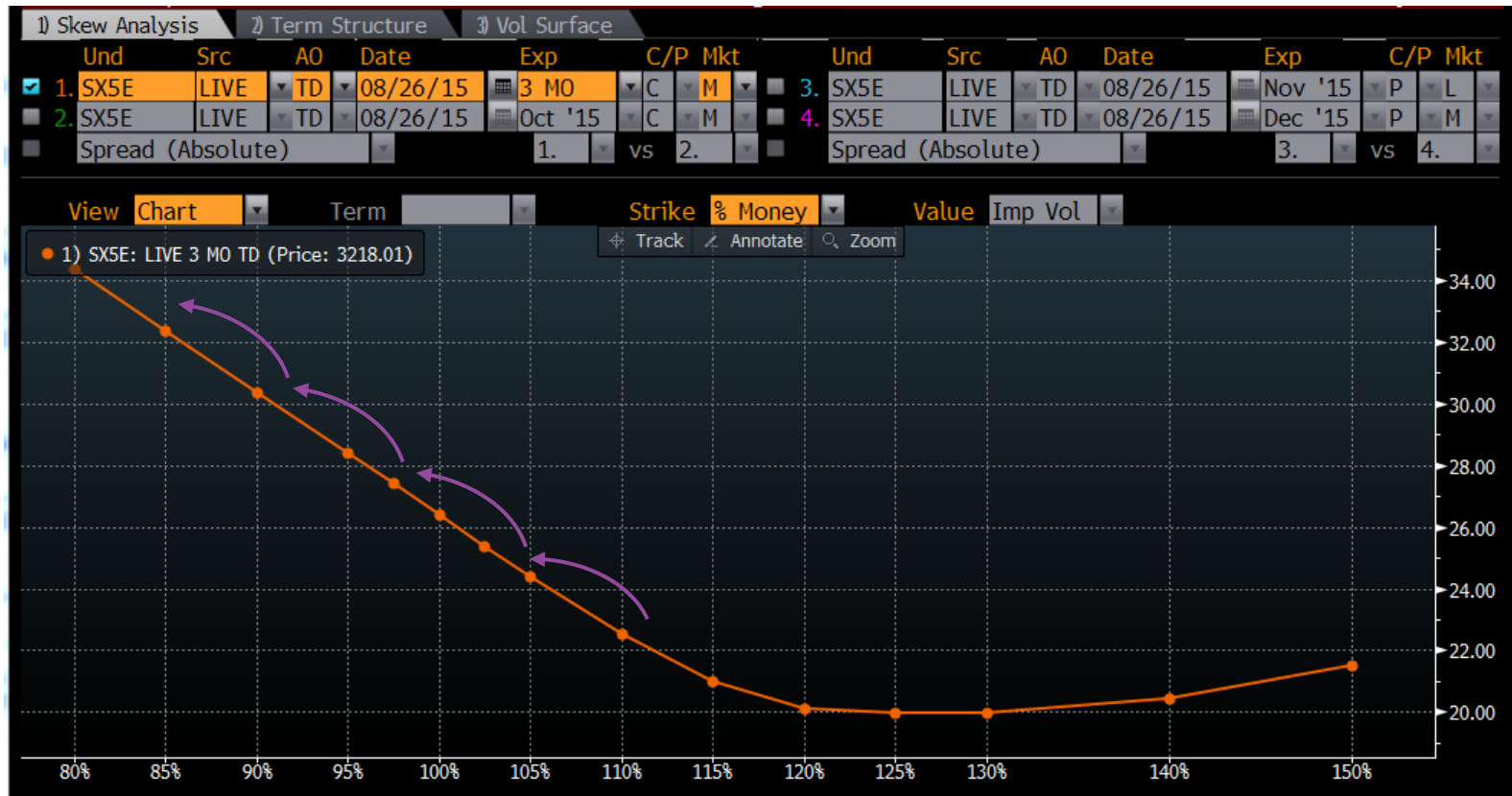
Source: Credit Suisse & Bloomberg (Data from Jan 2000 – June 2013)

Term Structure in Contango



The “cost of carry” is determined by the shape of the termstructure

Negative Skew: Put IV > Call IV



There is a premium to pay for downside protection

Investing in Volatility is Not Straightforward



Cost of carry is a direct consequence of contango... so why not doing the opposite?

Volatility Carry: A Slippery Fish

Which Sources of Alpha Can be Derived From Volatility?

Expensiveness of
Implied versus Realized
Volatility

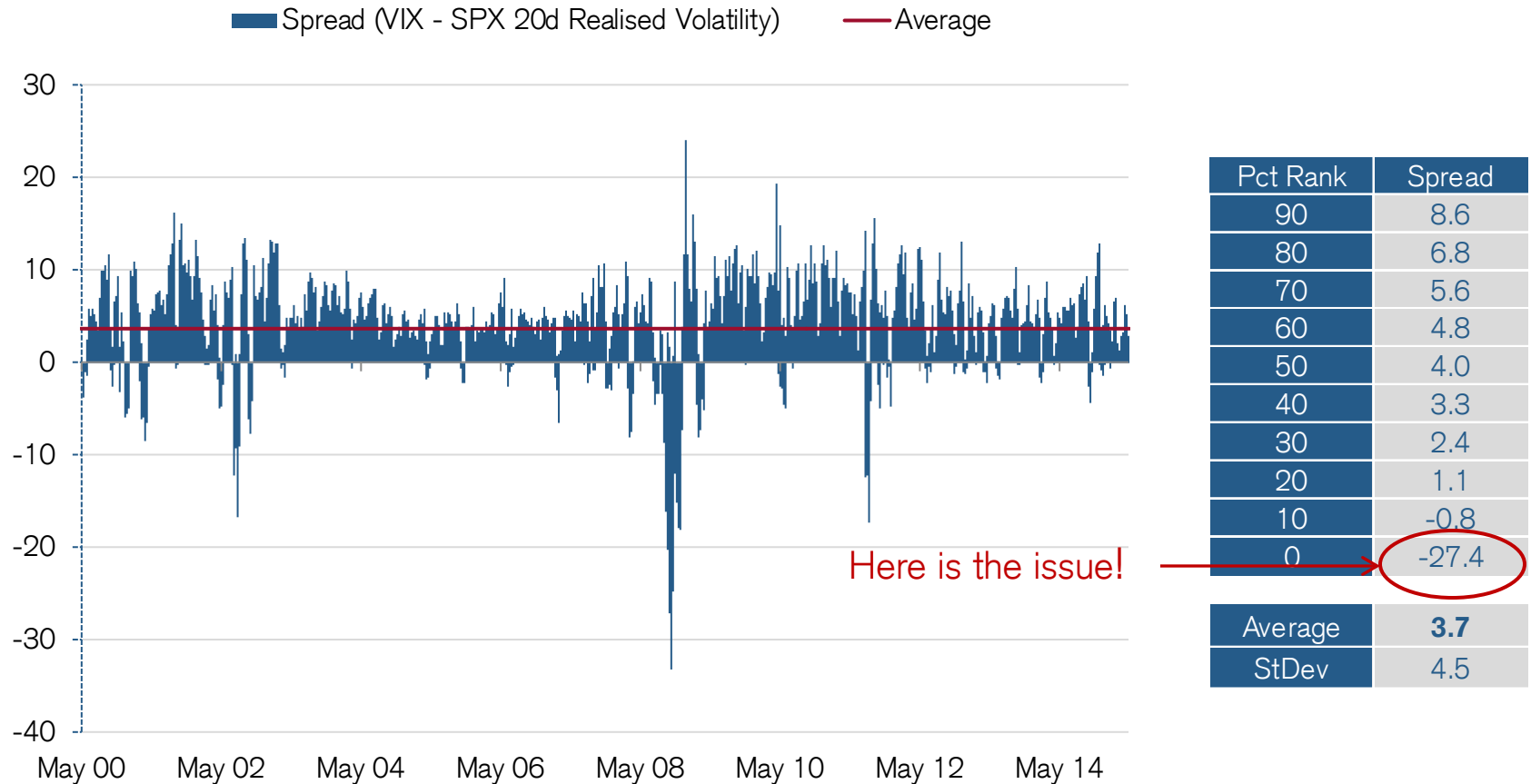
Term Structure / Roll
Down

Key Volatility Risk Premia Themes

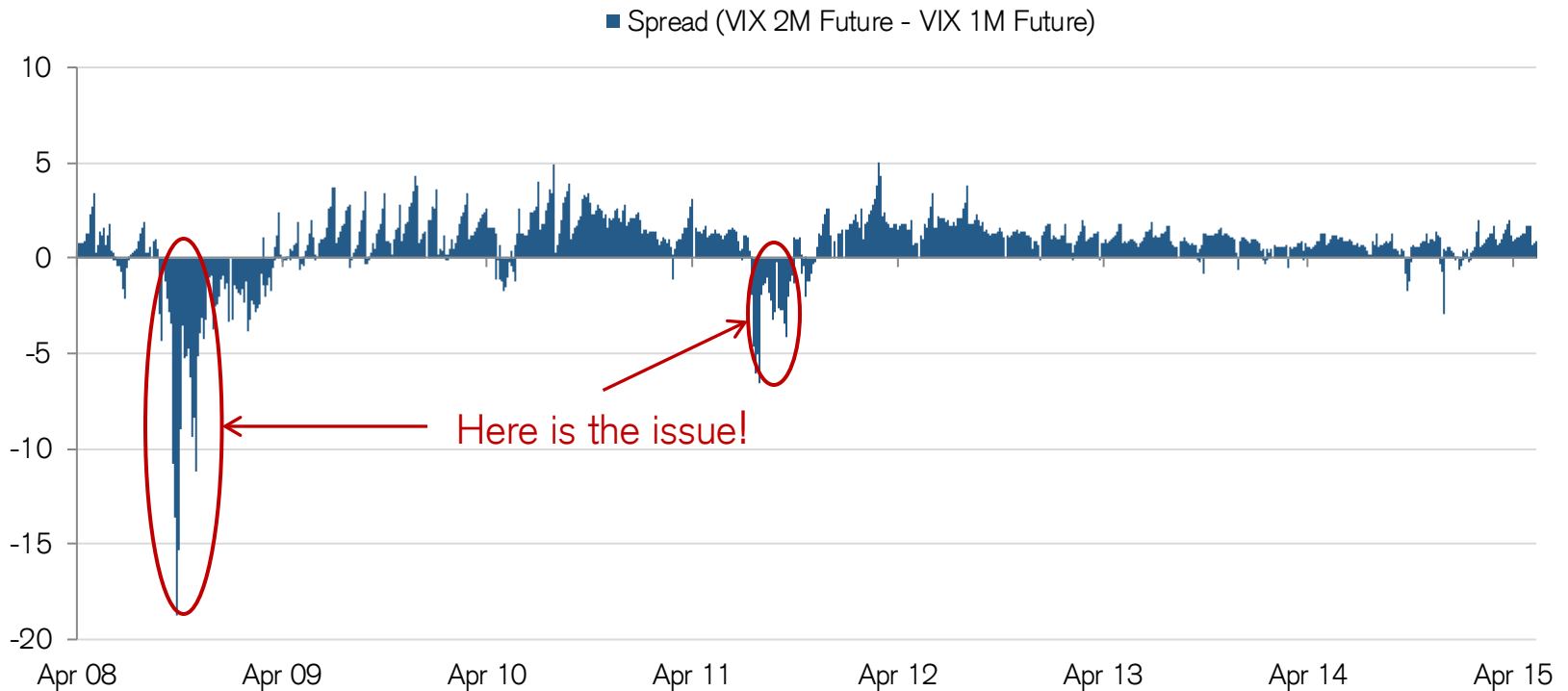
Expensiveness of
Volatility of Volatility

Other:
Dynamics of
Skew/Kurtosis
Statistical Relationships

Expensiveness of Implied Versus Realized Volatility



Term Structure/ Roll Down



Pct Rank	Spread 2M-1M	Spread 3M-2M	Spread 4M-3M	Spread 5M-4M	Spread 6M-5M
Average	0.7	0.4	0.3	0.3	0.3
StDev	1.8	1.1	0.8	0.6	0.5

How to Extract These Sources of Alpha?

Expensiveness of
Implied versus
Realized Volatility

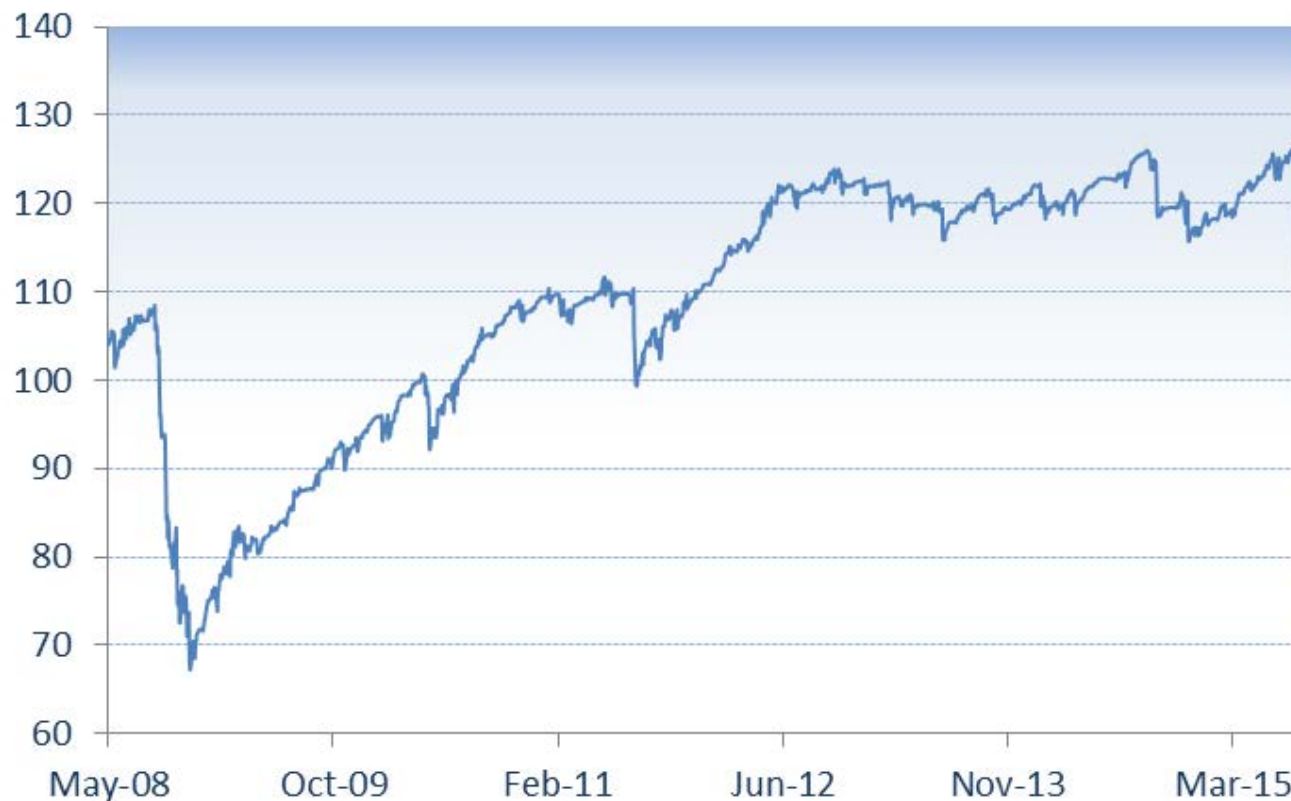
May be harvested by selling listed equity options and delta-hedging them on a daily basis or by selling an OTC variance swap.

Term Structure /
Roll Down

May be harvested through the VIX future term structure by selling the short end of the curve and buying further out. This strategy requires a constant rebalancing to ensure a constant duration.

Implied vs. Realised: Short SPX Options Daily Delta Hedged

Rationale
Monetising expensiveness of implied volatility versus realised volatility on the SPX
Implementation
Sell every month SPX short term downside puts delta hedged on a daily basis
Timing Signal
No signal
Risk Exposure
Vega: -0.5%



Source: Credit Suisse, Bloomberg. All figures based on data from 22 May 08 to 25 Aug 15. Past performance (actual or simulated) is not an indicator of future performance. The results presented are historical simulated results. As of 25 Aug 12 the strategy is not yet live and all data shown is for illustrative purpose only. This information is subject to change at any time in the full discretion of Credit Suisse. The terms outlined herein do not constitute an offer by Credit Suisse to enter into any transaction. The strategy returns are net of a 0.25%pa calculation fee.

Term Structure/Roll Down: Short VIX Future Roll Down

Rationale
Monetising the natural roll down (negative carry) of VIX term structure
Implementation
Sell 2 month duration rolling VIX future versus long 3 month duration rolling VIX future
Timing Signal
No signal
Risk Exposure
Vega Spread: 1% per Leg



Source: Credit Suisse, Bloomberg. All figures based on data from 22 May 08 to 25 Aug 15. Past performance (actual or simulated) is not an indicator of future performance. The results presented are historical simulated results. As of 25 Aug 12 the strategy is not yet live and all data shown is for illustrative purpose only. This information is subject to change at any time in the full discretion of Credit Suisse. The terms outlined herein do not constitute an offer by Credit Suisse to enter into any transaction. The strategy returns are net of a 0.25%pa calculation fee.

Virtual or Real Alpha

Alpha Comes and Goes. Outsmart It But With Caution!

- Equity volatility “naïve” Alpha has declined over the past few years as seen previously (despite a good start of the year in 2015)
- This has led to a need for alternative solutions or “smart” Alpha to compensate for lack of returns
- ... however, this search for which unfortunately can end up searching Alpha where there is none!

“Red Flags”

- Here is a sample of algorithmic volatility trading strategies which gathered a few billion in assets.
- Sharp deterioration in performance as soon as strategies went live ... a consequence of unintentional data mining ?



Source: Bloomberg (Data from June 2006 – July 2014)

“Red Flags”

Some of the common traps on systematic strategies may attributed to the below effects:

- **Multiplication of Embedded Signals in the Strategy:**

“With four parameters I can fit an elephant, and with five I can make him wiggle his trunk”

John Von Neumann

- **Lack of Fundamentals:**

The fallacy of: Post hoc ergo propter hoc (“After this, therefore because of this”)

Correlation does not imply Causation

“Noise can be confused with signal in many ways” Blinded by Optimism (Winton Capital, 2013)

- **Selection Bias:**

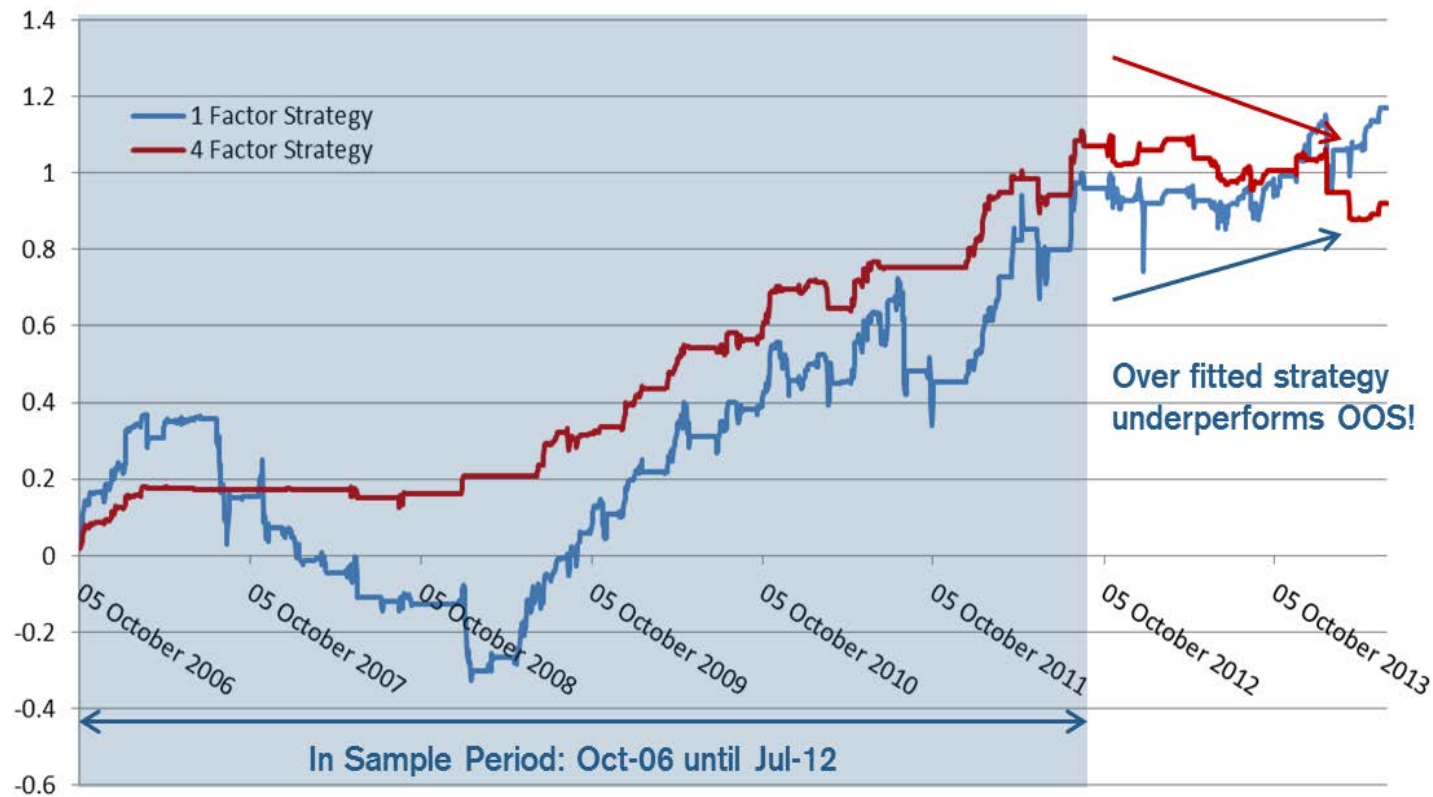
Selecting best-in-class strategies among a universe of backtested performance decreases the likelihood for the selected strategy to be effective. The bigger the sample of backtested strategies the smaller the probability for the strategy to perform.

- **Survivorship Bias or “Silent evidence” (The Black Swan, Nassim Taleb)**

Extrapolation of the Selection bias: A PM selecting CTAs purely based on performance and discarding poor strategies is likely to suffer “regression to the mean”

A Practical Example of Overfitting

By construction it is easier for a multi-factor strategy with a **large number of degrees of freedom** to fit the historical data without necessary a predictive role.



A Robust Approach to Volatility Trading

Our Approach to Strategy Development

- We believe that the development and construction of systematic strategies requires a deep knowledge and understanding of the underlying market as well as rigorous checks and balances to ensure the integrity of the strategy
- Over the years, a number of academics and market professionals have highlighted the risks and potential challenges of developing systematic solutions
- A commonly quoted risk of systematic strategies is “**over fitting**” as well as “**survival bias**” at the development stage
- The difference between in-sample performance and out-of-sample performance in systematic strategies has historically been significant in many cases
- Credit Suisse aims to minimise these risks as much as possible through the development of a rigorous and thorough **investment process**

Literature about systematic strategies highlights risks and concerns over their construction:

“Nobody has ever lost money on a spreadsheet.”

-Attain Capital

“Based on a large universe of ETFs, backtested performance has over performed live performance by more than 10%.”

- Vanguard 2012 study

- Other references : “*Pseudo-Mathematics and Financial Charlatanism: The Effects of Backtest Overfitting on Out-Of-Sample Performance.*” (D. Bailey, J.M. Borwein, M. Lopez de Prado, Q.J. Zhu)

Volatility Investing In 2 Steps

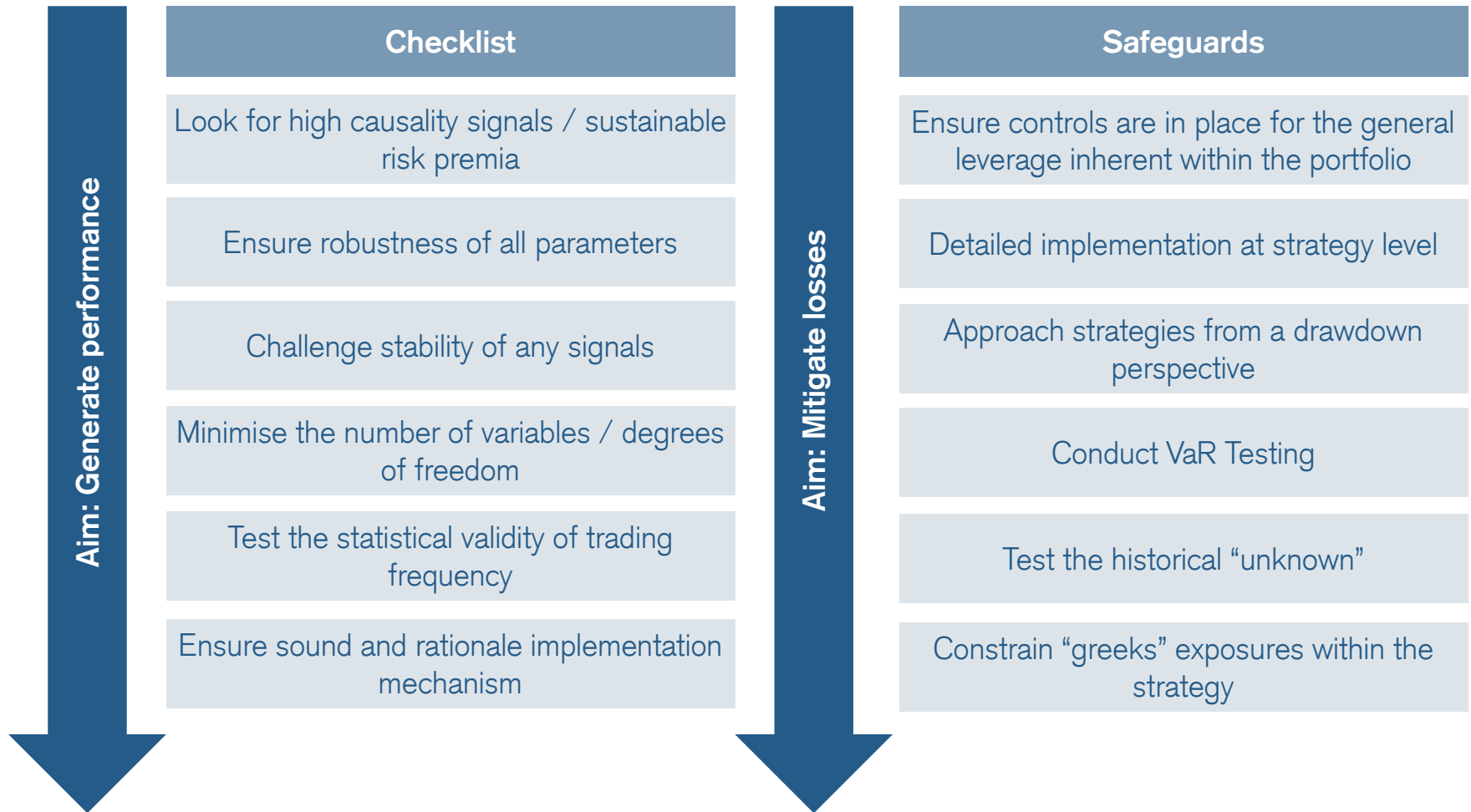
Strategy Design

Rule based strategies with strong fundamentals using transparent and liquid volatility underlyings and designed with risk budgeting

Portfolio Construction

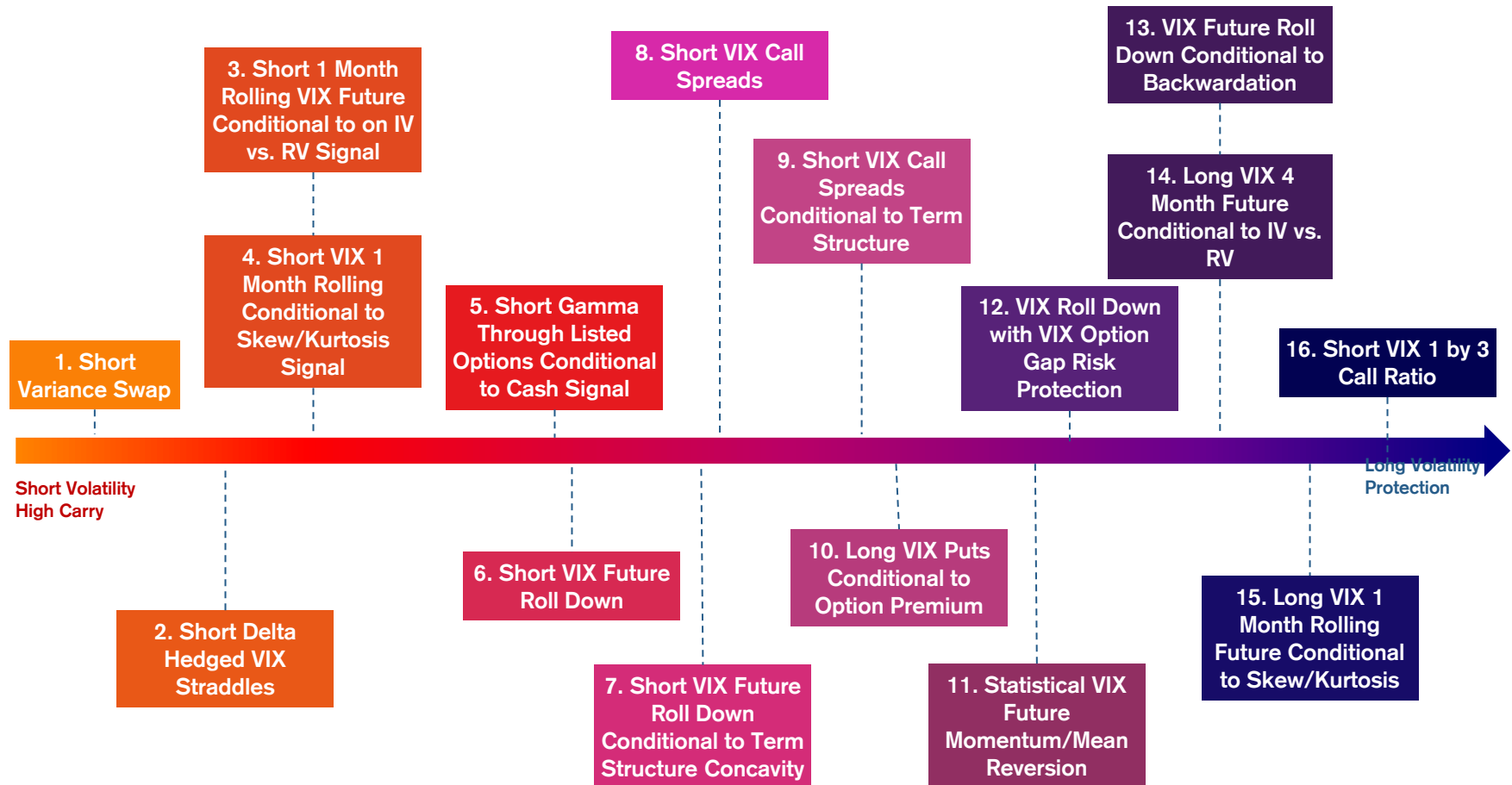
Don't put all your eggs in the same basket! Benefits of diversification can be seen even within the volatility asset class.

Strategy Design: Investment Process



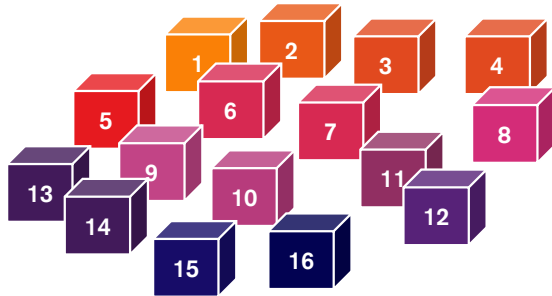
Building Blocks Approach

From Alpha Generation to Tail Risk Protection

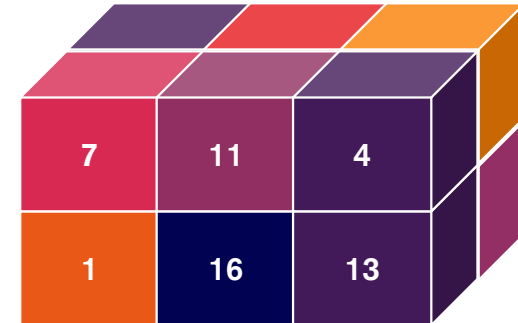
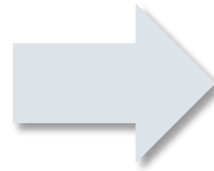


Portfolio Construction

From building blocks...



.... to portfolio construction



- Each strategy can be considered as a “building block” which can be incorporated a portfolio
- Each building block is designed to represent a single risk premia, and as such a portfolio approach to investing would allow the investor to exploit benefits of diversification

- Portfolio construction should be tailored to the investor’s own utility function
- Portfolio construction should aim to provide diversification by combining strategies displaying low pairwise correlations

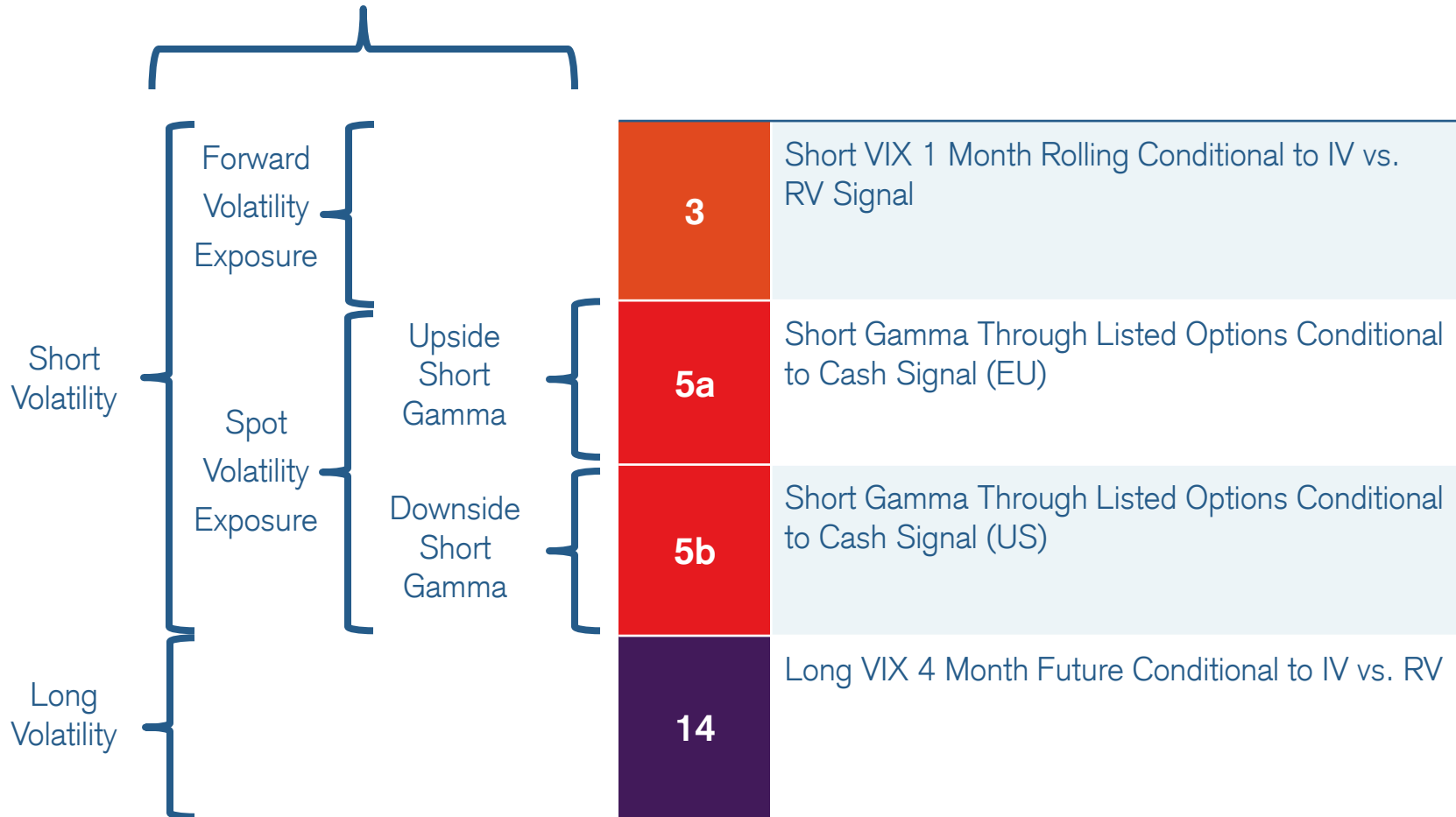
Portfolio Construction: Example of Balanced Portfolio

- Out of the 16 strategies considered, we have selected 4 volatility strategies which each aim to capture a different form of volatility risk premia.

	Strategy Description	Risk Premium Source
3	Short VIX 1 Month Rolling Conditional to IV vs. RV Signal	Difference between short term VIX future levels and the level of the VIX Index.
5a	Short Gamma Through Listed Options Conditional to Cash Signal (EU)	Difference between implied and subsequent realised volatility on the EuroSTOXX 50 Index.
5b	Short Gamma Through Listed Options Conditional to Cash Signal (US)	Difference between implied and subsequent realised volatility on the S&P 500 Index.
14	Long VIX 4 Month Future Conditional to IV vs. RV	Paying risk premium (slope of the VIX term structure) to gain long volatility exposure.

Portfolio Construction: Fundamental Diversification

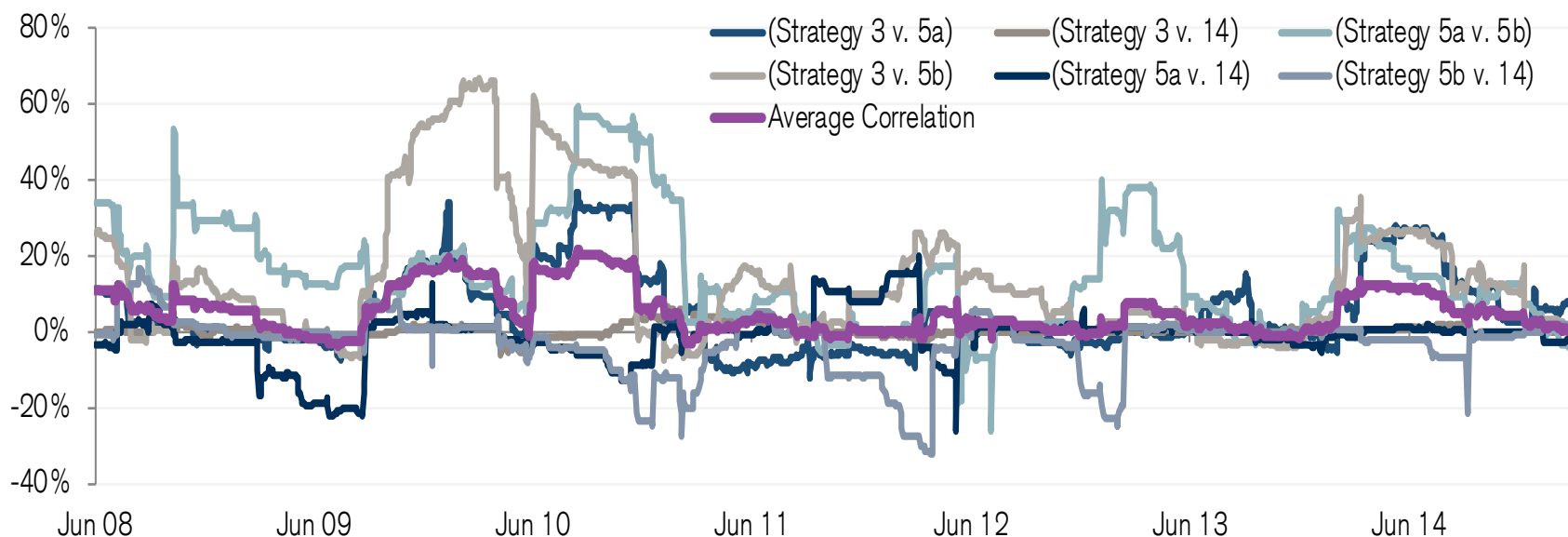
Select strategies which should fundamentally display low correlations



Historical Correlation Between the 4 Volatility Strategies:

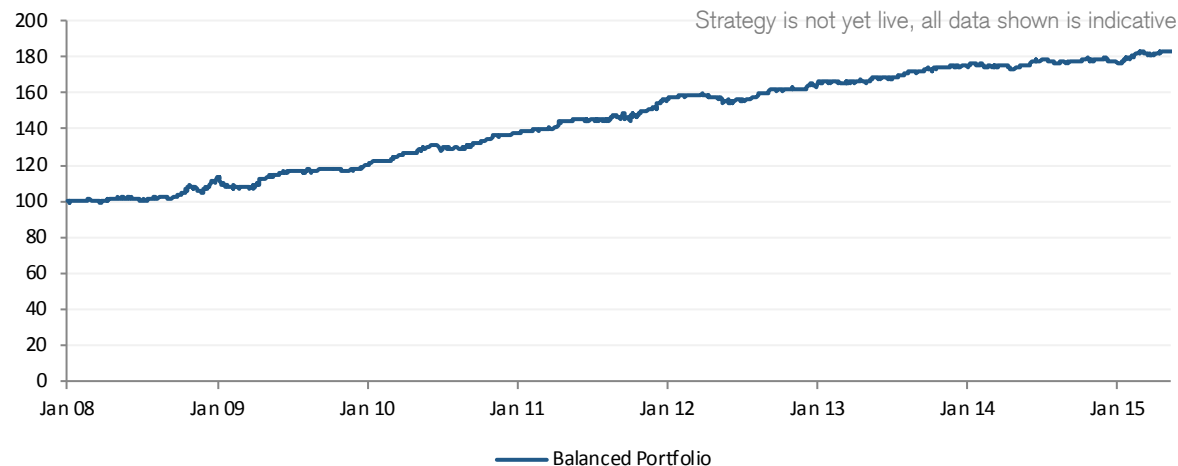
The historical, simulated correlation between each component strategy has been relatively low, indicating a potential diversification benefit when combining them within one investment.

Historical (simulated) rolling 120-day correlations between the component strategies:



Historical Performance: Overview

Historical Performance



Performance Statistics

Annualised Return	8.5%
Annualised Volatility	4.3%
Sharpe Ratio	1.90
Maximum Drawdown	-5.7%
Maximum Time to Recovery (days)	97
Average Time to Recovery (days)	10
Calmar Ratio	1.50
Average Monthly Performance	0.7%
Best Monthly Performance	5.9%
Worst Monthly Performance	-3.3%
%age of Positive Months	75.9%
Average Daily Performance	0.0%
Best Daily Performance	1.8%
Worst Daily Performance	-1.8%
%age Positive Days	54.3%
Average Positive Day	0.2%
Average Negative Day	-0.1%

(Simulated) Monthly Performance

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
2007													
2008		0.1%	-0.1%	1.5%	0.7%	-1.4%	1.1%	0.4%	1.0%	4.8%	-2.8%	5.9%	
2009	-3.3%	0.5%	0.0%	4.2%	1.7%	1.6%	-0.2%	0.7%	0.7%	-1.1%	0.4%	2.4%	7.7%
2010	1.6%	0.7%	2.9%	0.3%	2.4%	-1.5%	1.4%	0.4%	1.9%	1.8%	1.1%	1.0%	14.8%
2011	1.1%	0.5%	0.4%	3.1%	0.6%	0.0%	-0.4%	1.5%	-1.3%	2.8%	1.6%	2.7%	13.4%
2012	1.2%	0.6%	0.1%	-0.8%	-1.6%	0.2%	1.5%	1.5%	0.9%	0.3%	0.2%	0.5%	4.7%
2013	1.7%	-0.5%	0.5%	0.0%	1.3%	0.0%	1.3%	0.7%	1.0%	0.6%	0.3%	0.0%	7.1%
2014	0.4%	0.0%	-0.3%	-0.7%	0.8%	1.6%	-0.7%	0.0%	0.3%	0.4%	0.5%	-0.9%	1.3%
2015	1.1%	2.0%	-0.7%	0.8%									3.1%

Source: Credit Suisse, Bloomberg. All figures based on data from 03 Jan 08 to 13 May 15. Past performance (actual or simulated) is not an indicator of future performance. The Balanced Portfolio is not yet live and all data shown is purely for indication purposes. The Index returns are net of a 0.25% p.a. calculation fee within each component strategy and a 0.50% p.a. basket fee. Proforma date: 03 Jan 2008

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