

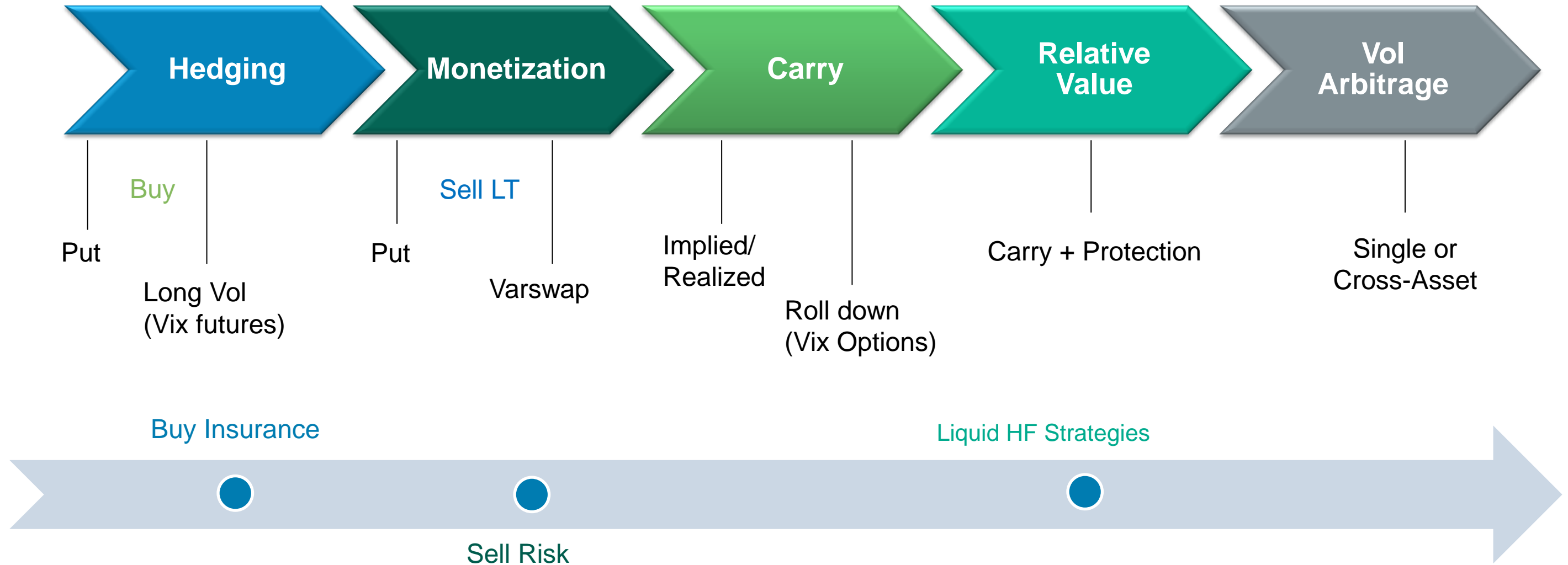


# Global Volatility Summit Volatility 101

Overview of Volatility Uses by Institutions



# Path to Volatility



For Illustrative Purposes Only



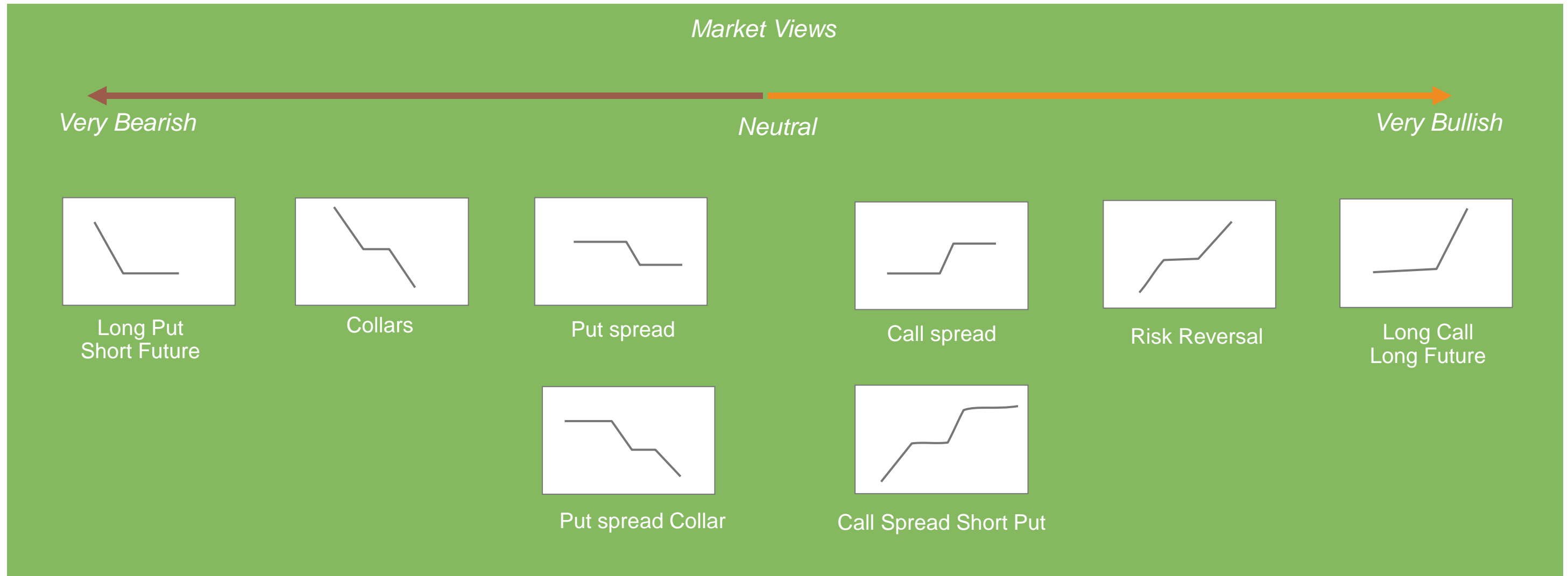
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1 April 2014 | 2

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# HEDGING: From Risk Management to Equity Replacement

Use options to manage the exposure you need to equities



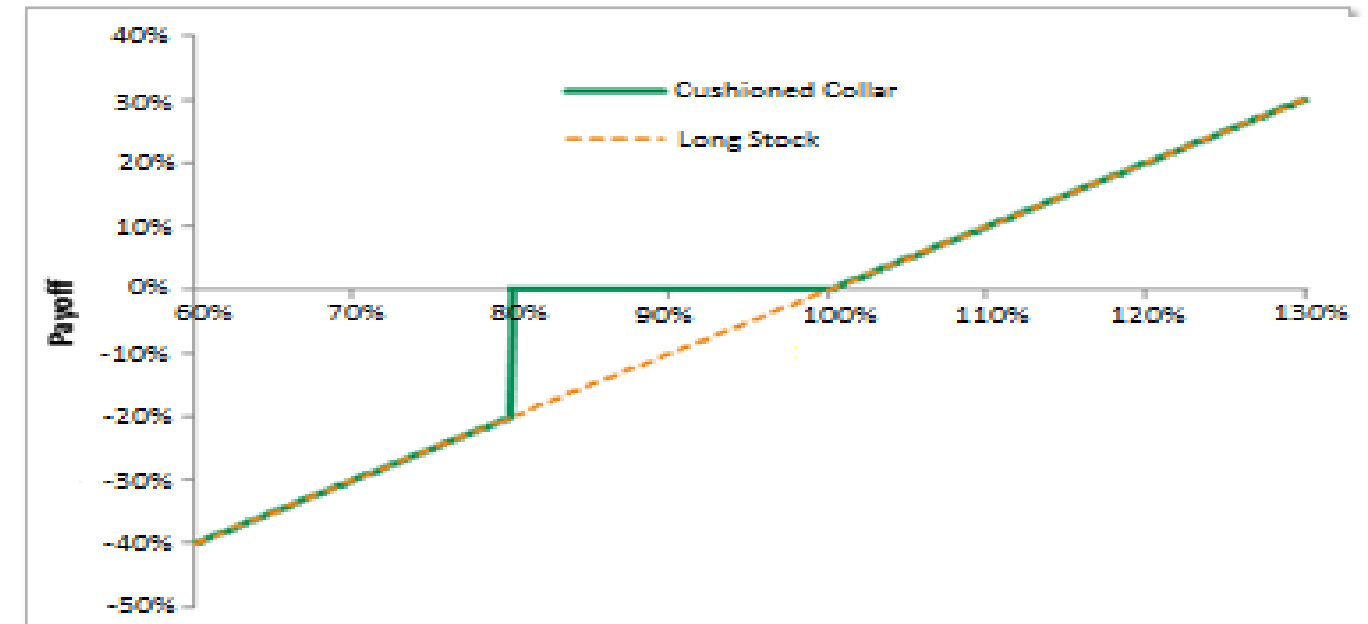
*For Illustrative Purposes Only*



Keep upside exposure, selling downside with a cushion

- ATM Call Option
  - Asymmetric payoff
- Costless Cushioned Collar [Short **Down & In Put** + Long Call]
  - Buying a cushioned collar rather than a long position is a method to transform the return profile
  - In a cushioned collar, there is a cushion within with the underlying can decline before the investor is exposed to losses
  - The ability to create that cushion is due to the **skew of the underlying**
- Risk: If the downside barrier is breached, the investor becomes long the underlying

Payout at Expiry of Cushioned Collar - 80% Barrier

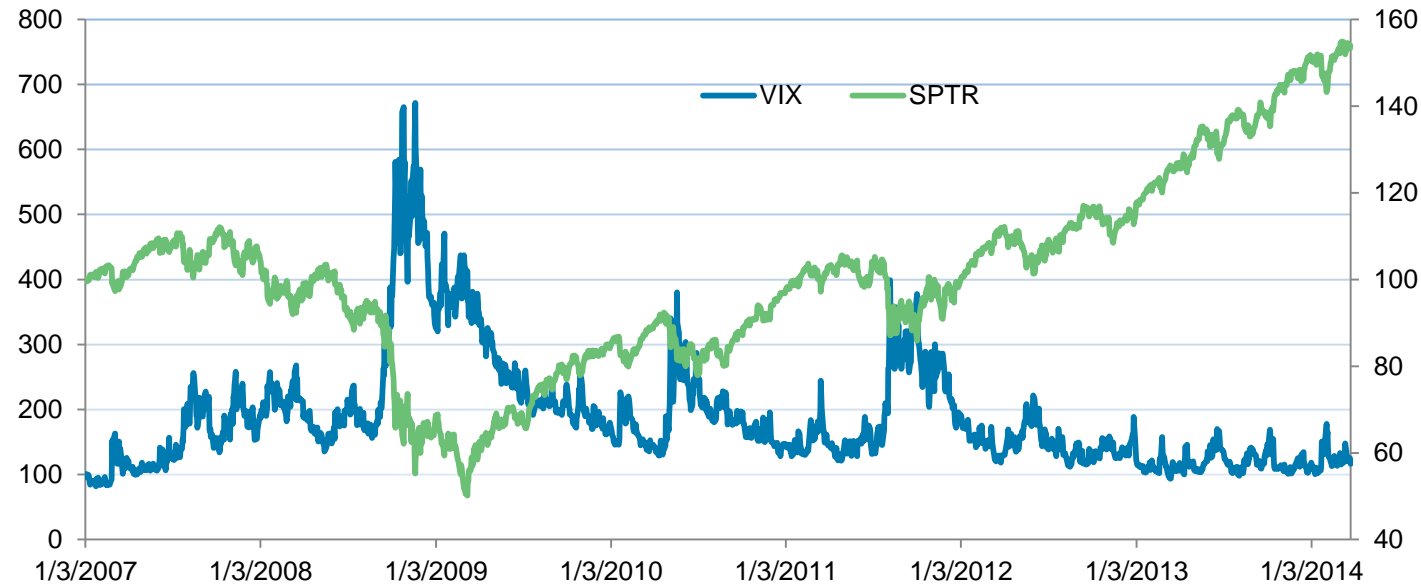


Source: Bloomberg, BNP Paribas  
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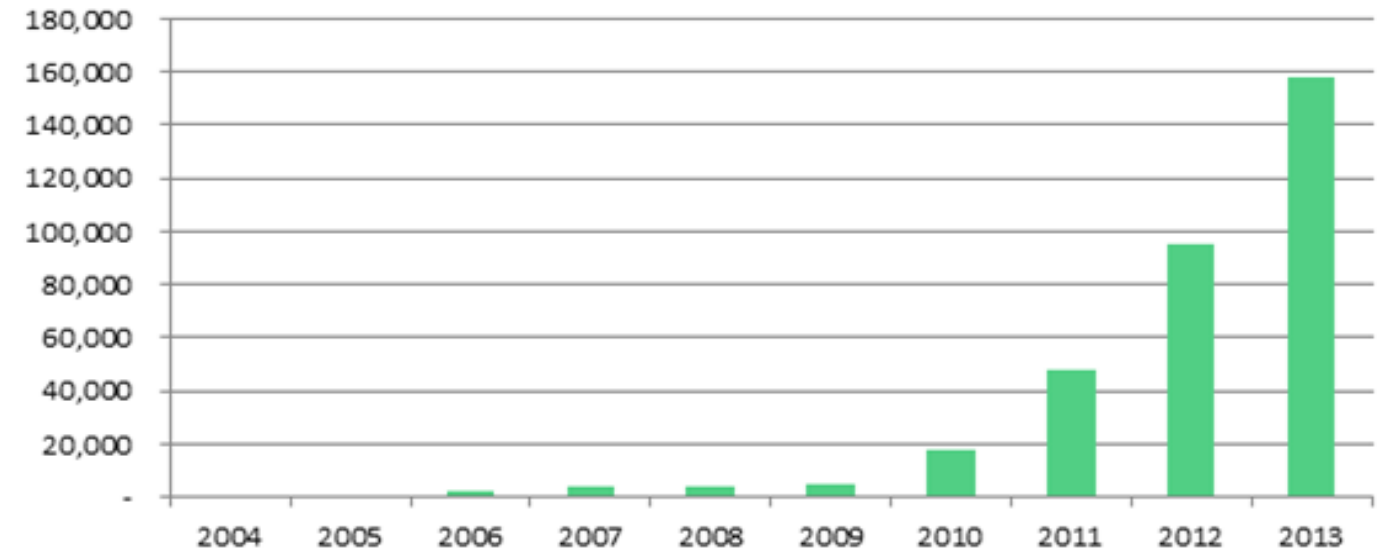
# HEDGING: VIX futures: More than the Fear Index ?

## Decorrelation to Equity

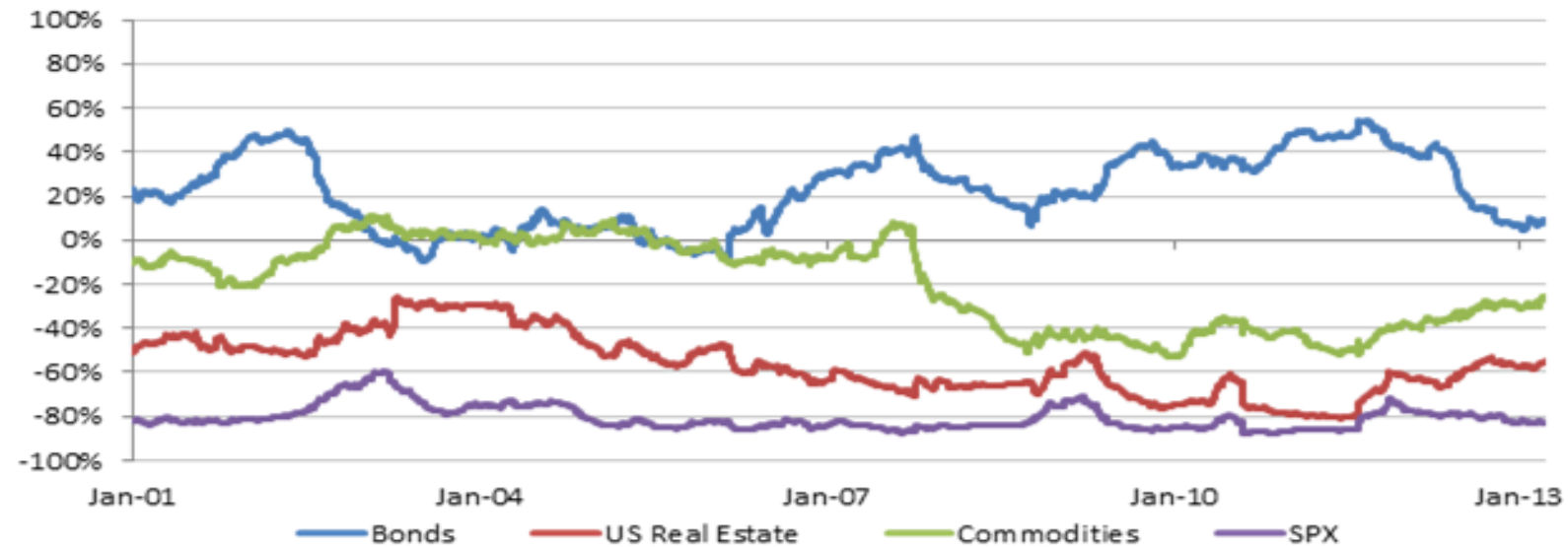


## Liquidity

### Average number of VIX futures traded daily



## Historical 1y Correlation



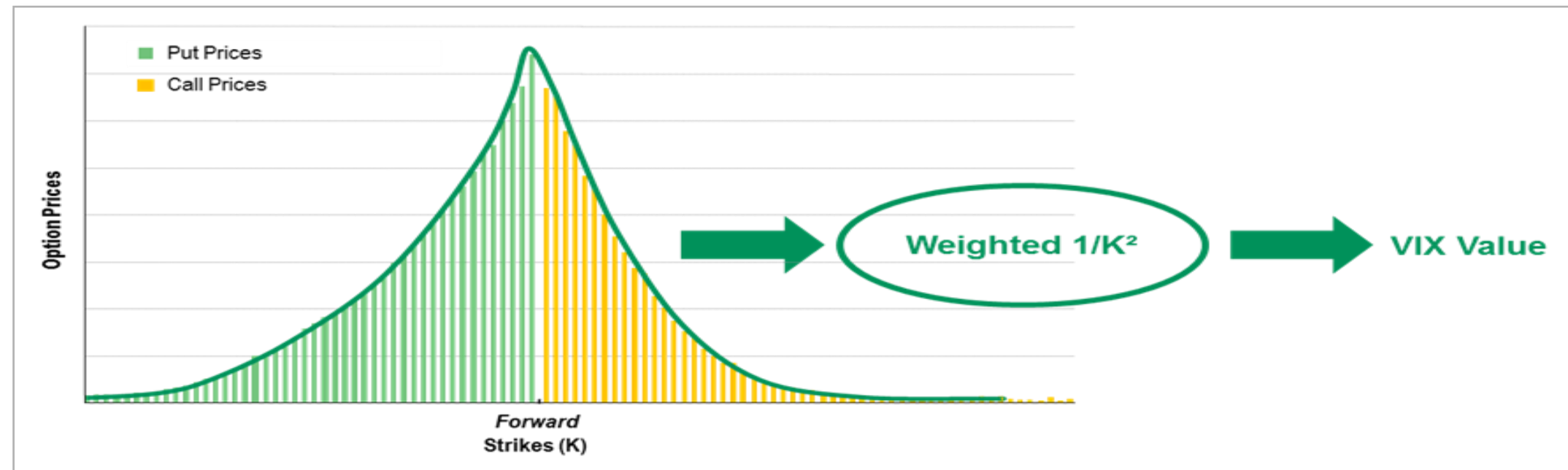
Source: Bloomberg, BNP Paribas.



## VIX Introduction

The VIX measures the market's 30d implied vol by the S&P 500 Index listed option prices.

- Estimates Implied Volatility
  - It estimates IV by averaging the weighted prices of SPX puts and calls over a wide range of strike prices
- Not Directly Investable
  - No portfolio of assets / derivatives worth the VIX at the same time
  - An options portfolio worth the VIX at time "t" will suffer theta decay, whereas the VIX doesn't (VIX maintains a 30d IV horizon)



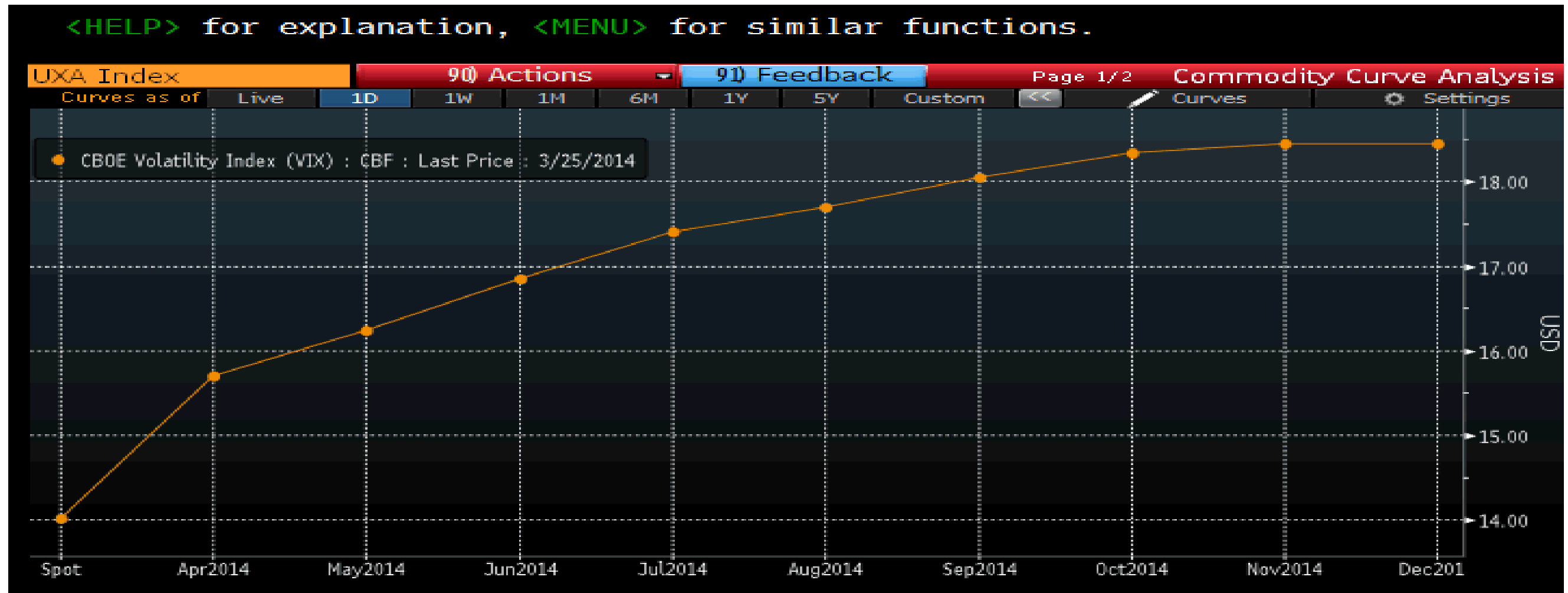
Source: BNP Paribas  
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## VIX Futures

The VIX can be accessed via VIX Options or VIX Futures: One contract = \$100 vega

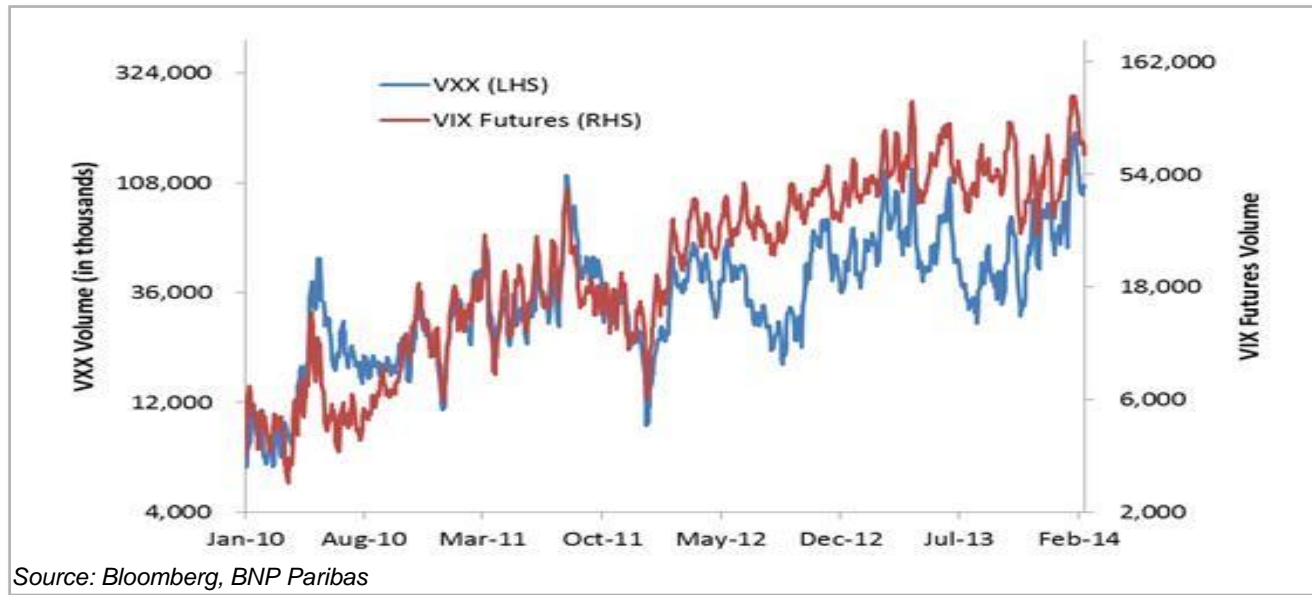
- Access the VIX via Futures
  - VIX Futures reflect today's expectation of what the VIX will be worth in the future.
- VIX Term structure



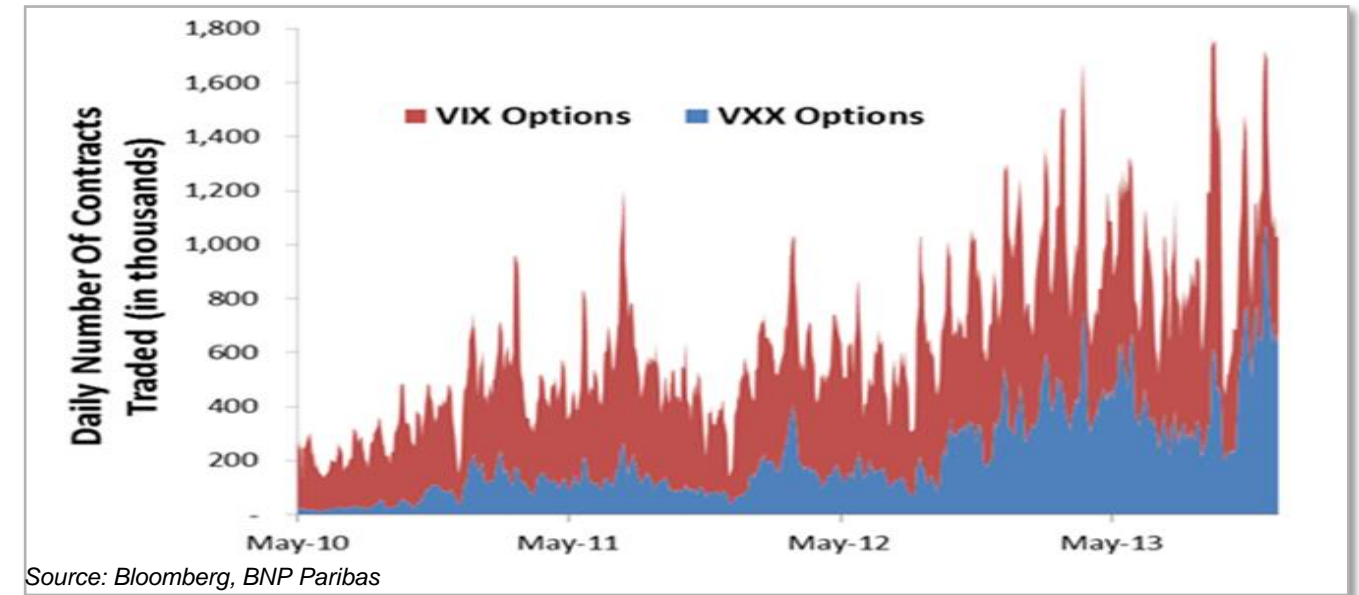
Source: Bloomberg



## VIX Futures and VXX Daily Volume



## VXX and VIX Options Volume



- VXX: an ETN holding a synthetic 1 month VIX future
  - Investing in VXX is essentially equivalent to holding a 30-day time-weighted blend of the first and second month VIX futures contracts (out of 7 listed VIX futures expiries)
- The most successful volatility ETN:
  - The most liquid volatility ETN (current trading volume of around 23,000,000 shares per day as of January 8th 2014)
  - One of the main driver of the liquidity in VIX futures.
  - A very active option market



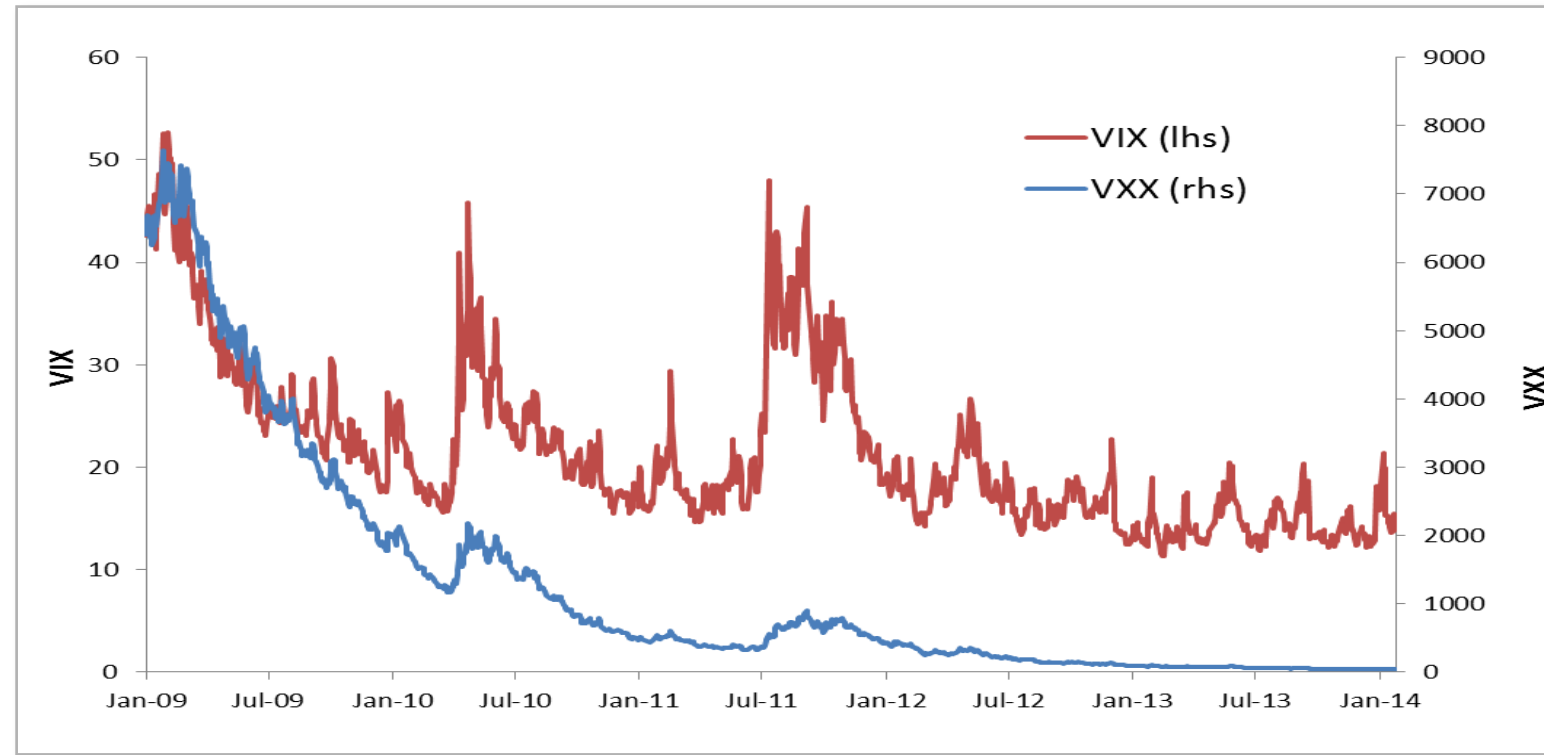
VXX is one of the most liquid instrument to trade volatility





# VXX performance compared to VIX

## VXX vs VIX performance



Source: Bloomberg, BNP Paribas. For illustrative purposes only – not indicative of actual performance. Past performance is not indicative of future results, which may be better or worse than previous results.

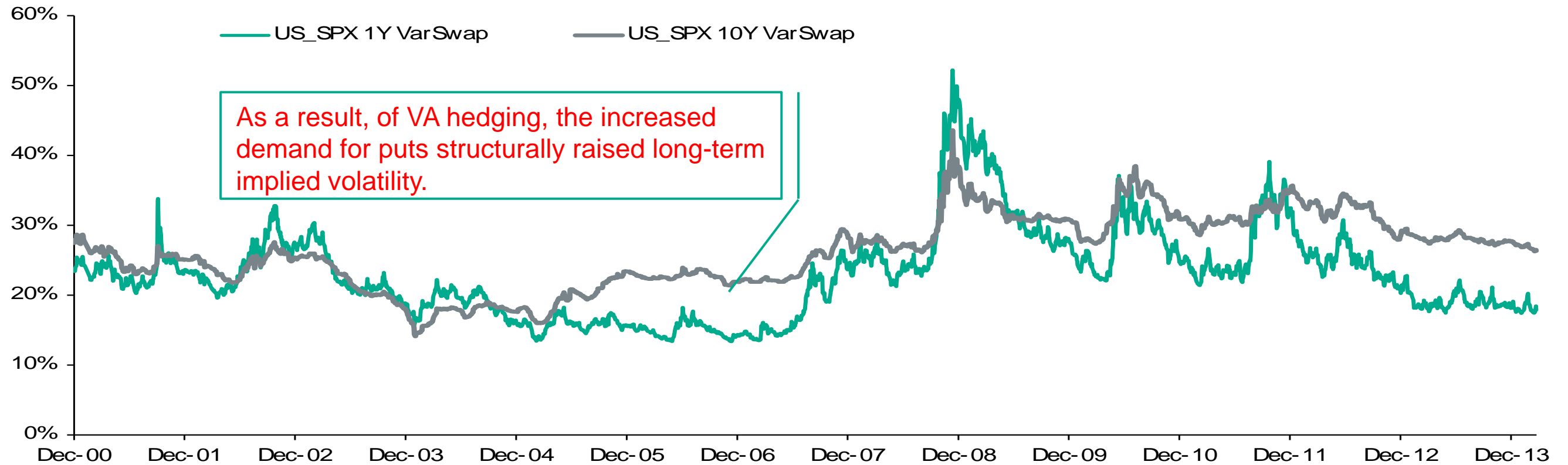
- VXX was initially marketed as a vehicle to hold a long volatility position
- Over the long term the cost of carry is the main driver of VXX performance.



Historically short VXX has been more attractive than long VXX



- Sell Long Dated Put Options
  - Equity Replacement: Short Vol = Long Equity
  - Easier to implement than Variance Swaps (historically)
  - Long Interest Rates
- Sell Long Dated Variance Swaps



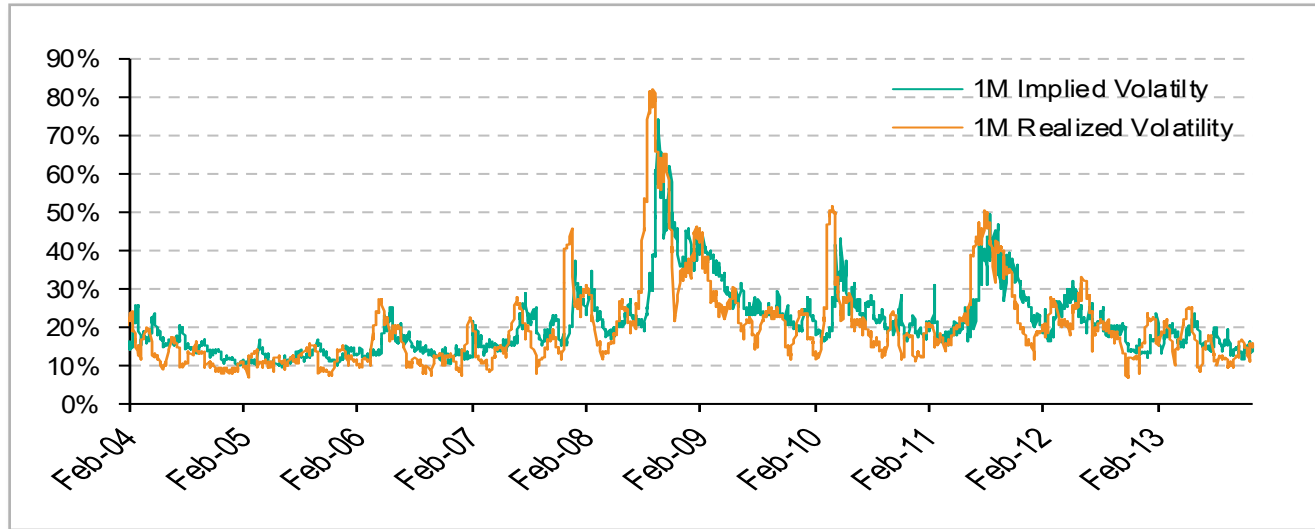
Source: BNP Paribas. For illustrative purposes only – not indicative of actual performance. Past performance is not indicative of future results, which may be better or worse than previous results.



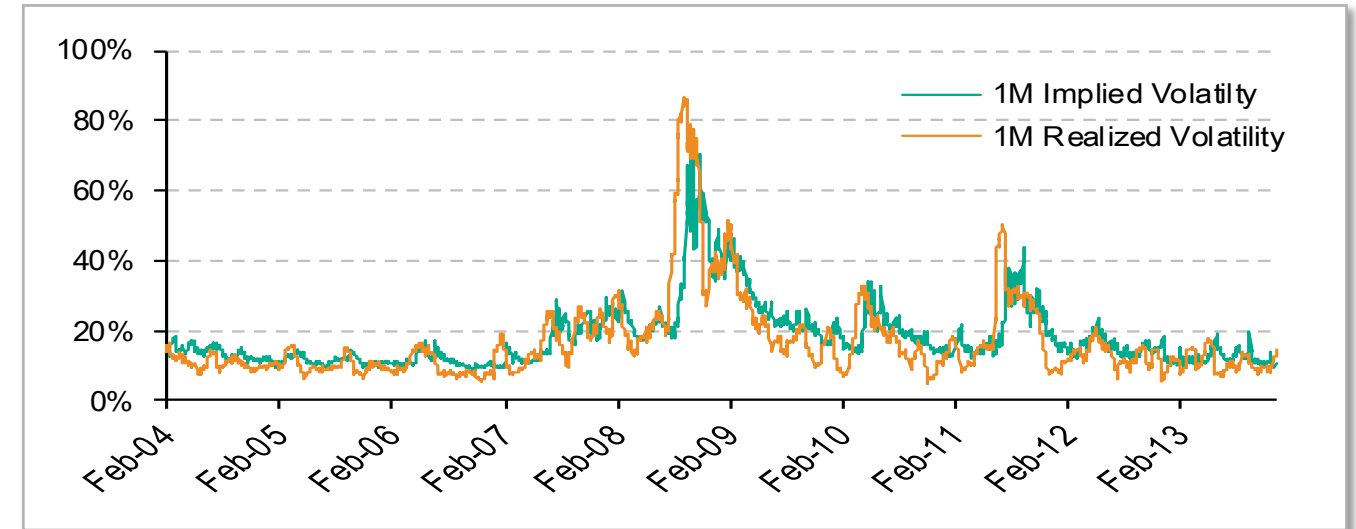
# CARRY: Implied vs Realized

Difference	SX5E	DAX	NKY	SPX
<b>Average</b>	0.9	0.8	1.4	1.2
<b>Median</b>	1.8	1.7	2.7	2.0
<b>Risk   20% cvar</b>	-10.1	-9.0	-10.8	-8.6

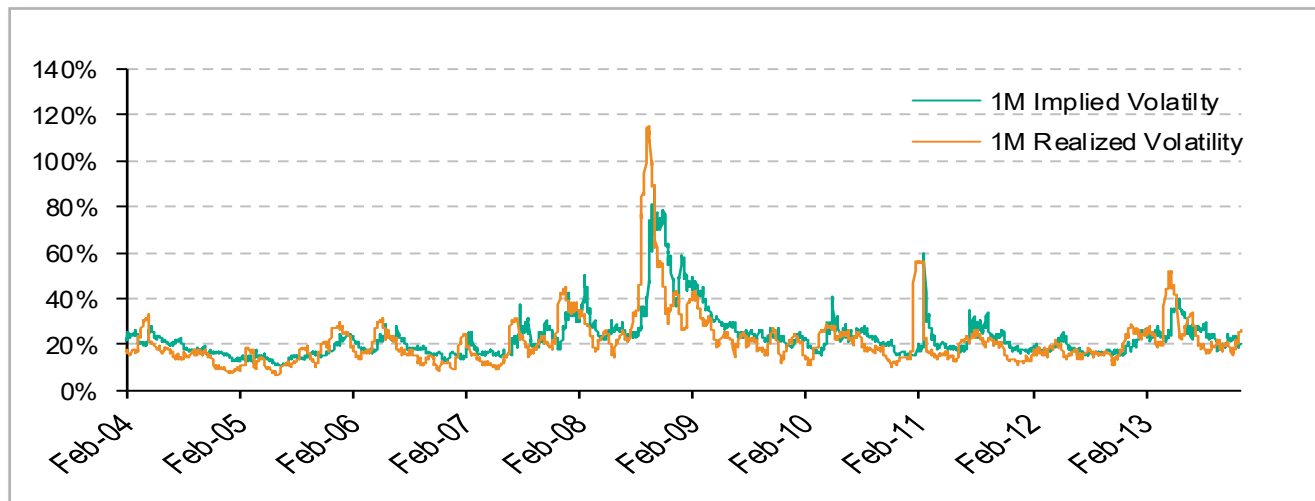
## SX5E



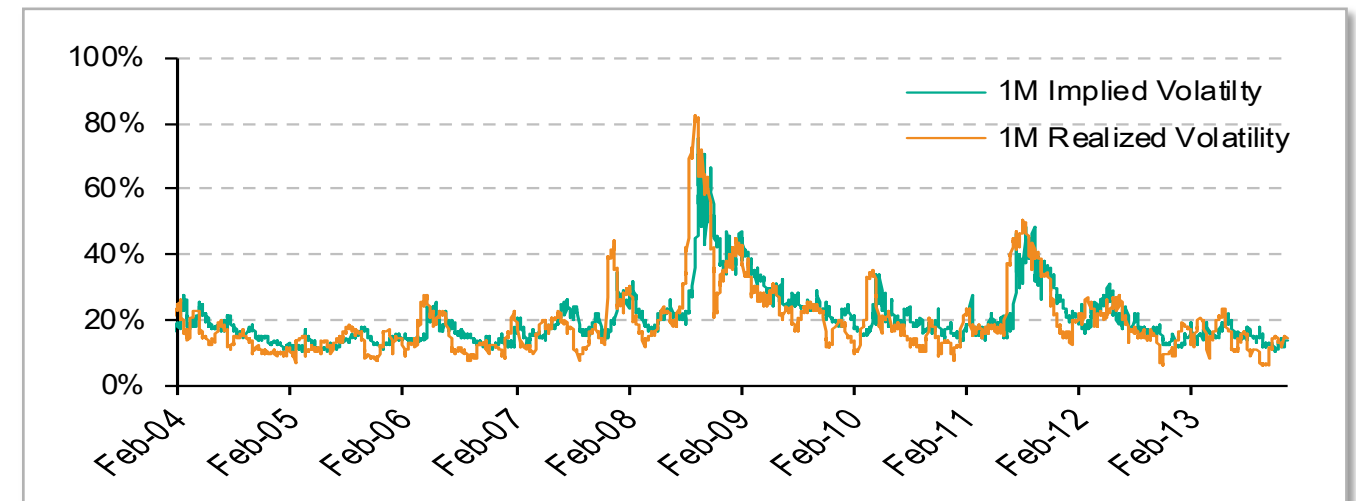
## SPX



## NKY



## DAX

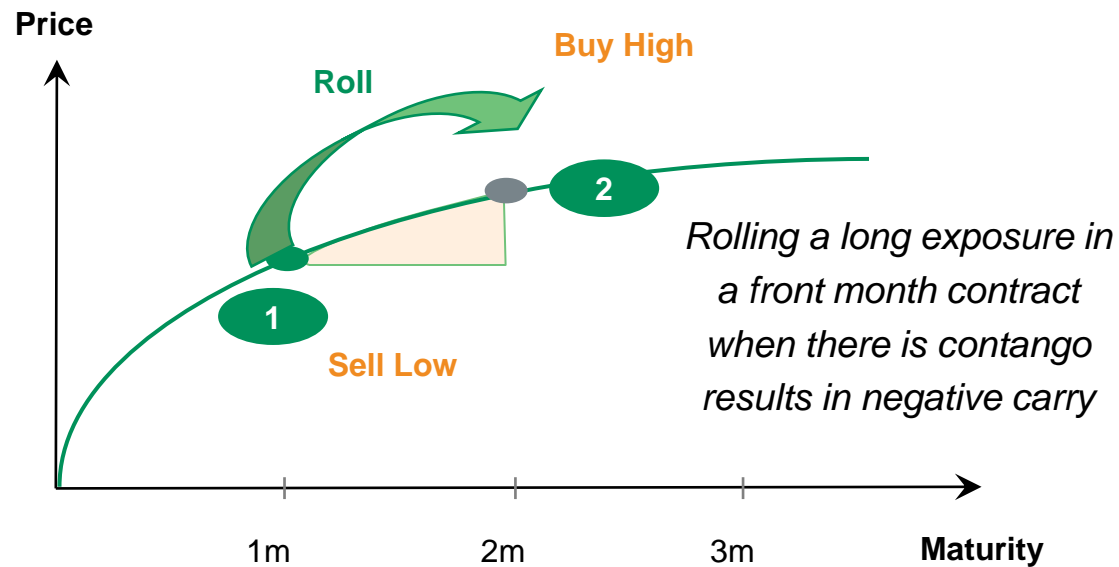


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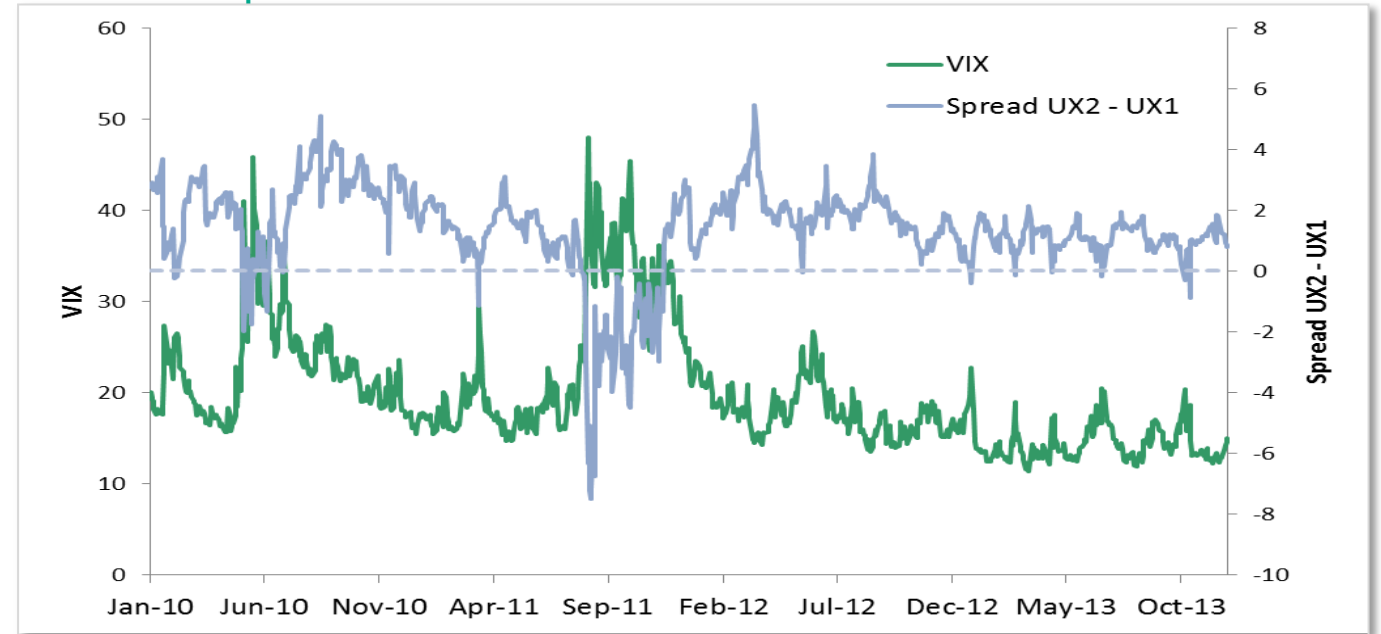
# CARRY: VIX Futures Contango Explains VXX Decay

- Investing in VXX is equivalent to holding a 30-day time-weighted blend of the first and second month VIX futures contracts.
- To maintain this average 30 day VIX future exposure VXX rolls systematically from the first to second future.
- Historically the VIX future term structure has been in contango.
- This has led to a significant VXX decay over the last 4 years.



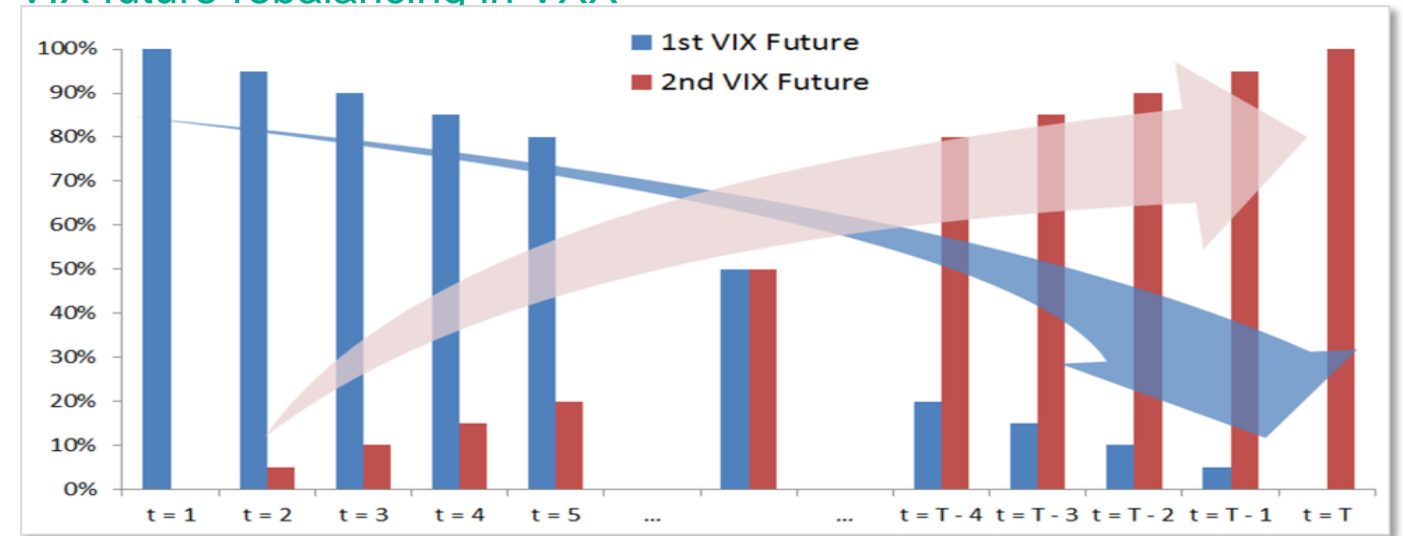
Source: BNP Paribas  
For illustrative purposes only

## Historical spread between VIX second and first future



Source: Bloomberg, BNP Paribas

## VIX future rebalancing in VXX



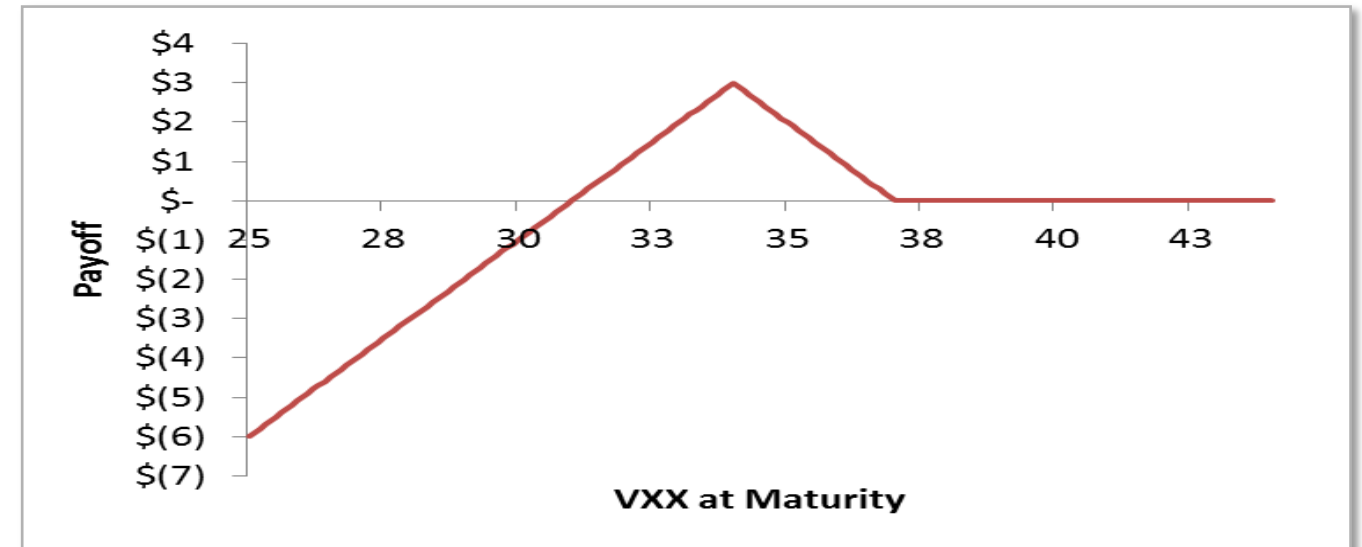
Source: BNP Paribas



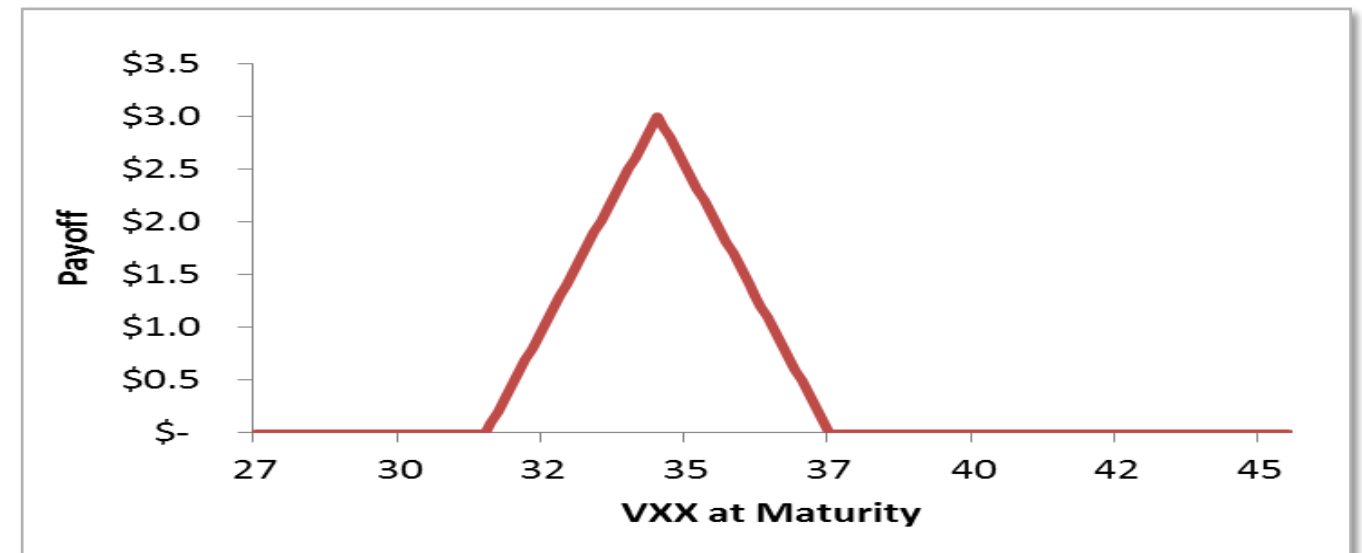
## CARRY: VXX Trade Ideas

- Put Ratio: Close to Zero Cost Exposure to VXX Decay
  - *Trade:* Buy one Jun-14 37 Put and sell two Jun-14 34 Put on VXX @ \$0.29 indicatively
  - Strikes chosen so that P&L remains positive in the worst case in our simulations
  - *Risk:* the investor faces downside risk if VXX drops significantly and can lose up to \$31.
  
- Put Fly: Range Bound Positioning with Limited Downside Risk
  - *Trade:* Buy a Jun-14 31/34/37 Put Fly on VXX @ \$1.39 indicatively
  - Maximum return is 2.2x the premium
  - *Risk:* The investor may lose the entire premium

Put Ratio Payoff



Put Fly Payoff



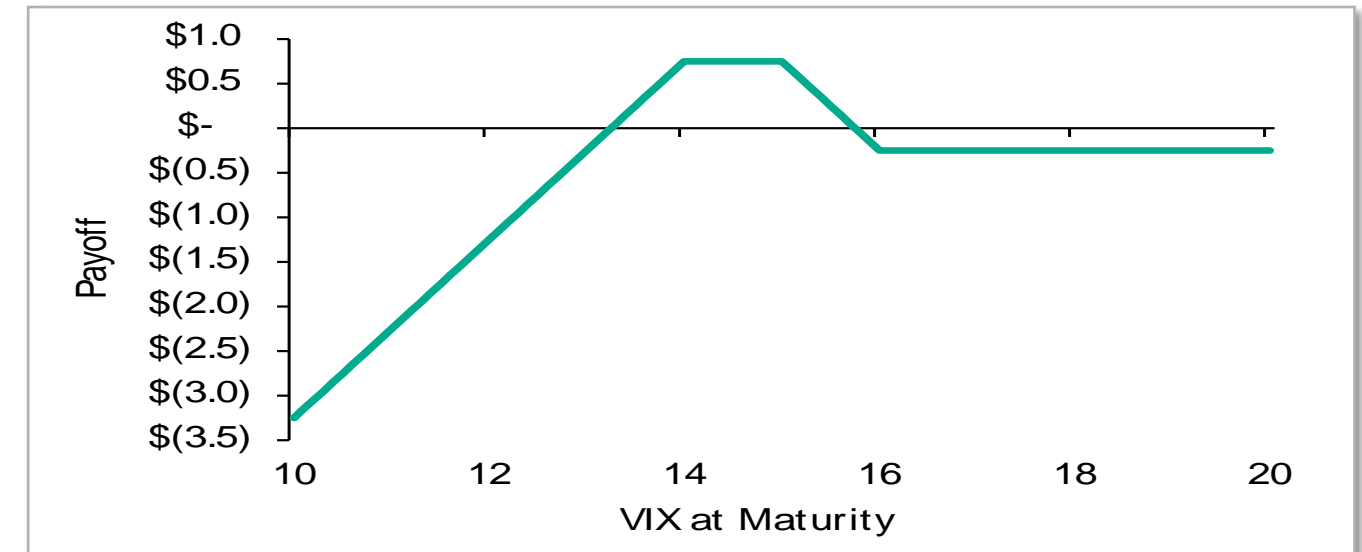
Source: BNP Paribas. Prices are indicative. As of 2/21/14. Reference VXX: 43.01.



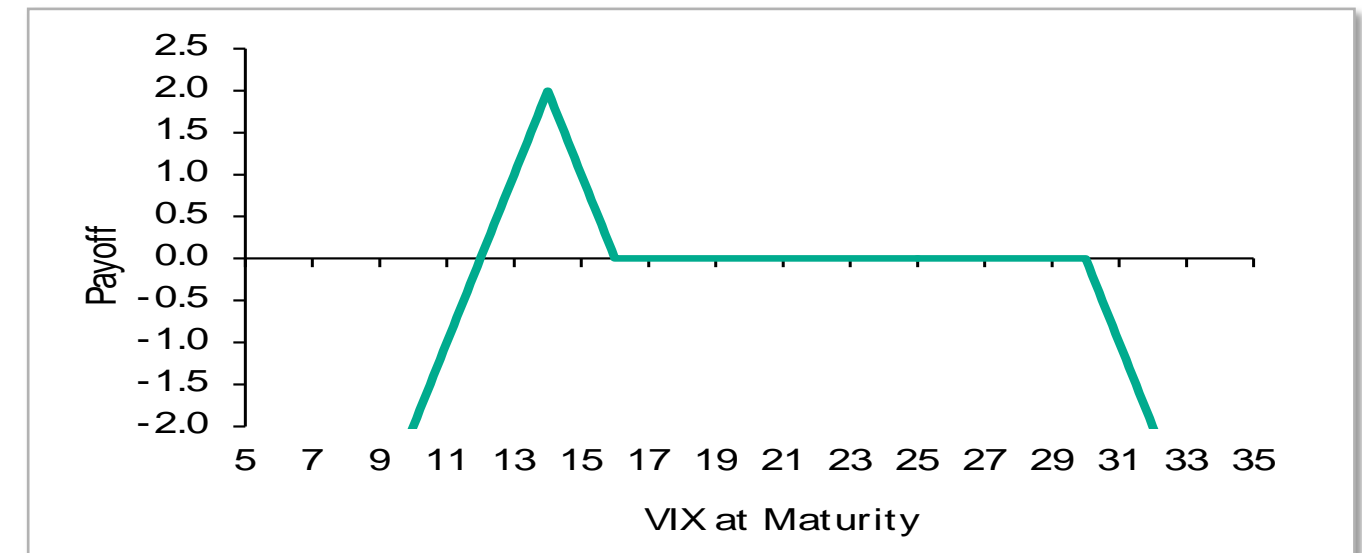
## CARRY: VIX Trade Ideas – Carry

- Buy a Put Tree to play a range bound view
  - *Trade:* Long a July 16 put (\$1.60), short a July 15 put (\$0.90), and short a July 14 put (\$0.45) for a total cost of \$0.25 (VIX ref. 14.2)
  - Estimated gain of \$0.01 if the curve stays stationary (“travels through time”) over 30 days
  - *Risk:* Buyers of puts are a risk of losing their entire premium. Sellers of puts have unlimited risk.
  
- Long 1 x 2 Put Spread financed by selling a call
  - *Trade:* Buy a August 16-14 1x2 Put Spread financed by selling a 30-strike call indicatively costless (VIX ref. 14.2)
  - Estimated gain of \$0.12 if the curve stays stationary (“travels through time”) over 30 days
  - Should the VIX fall to 13, there is an estimated gain of \$0.17.
  - *Risk:* Buyers of puts are a risk of losing their entire premium. Sellers of puts have unlimited risk.

Put Tree



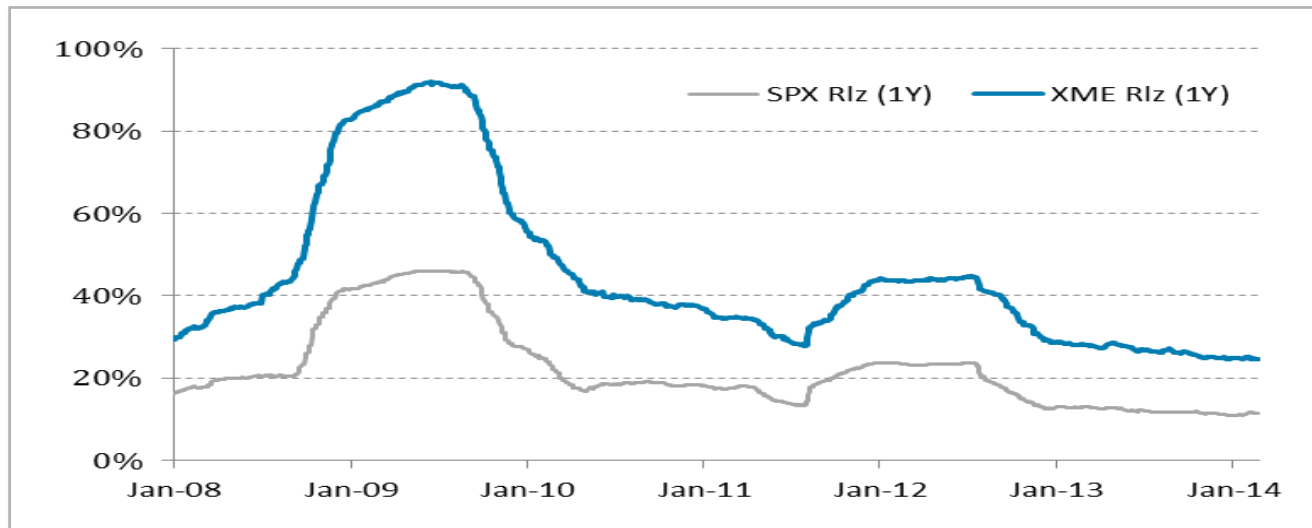
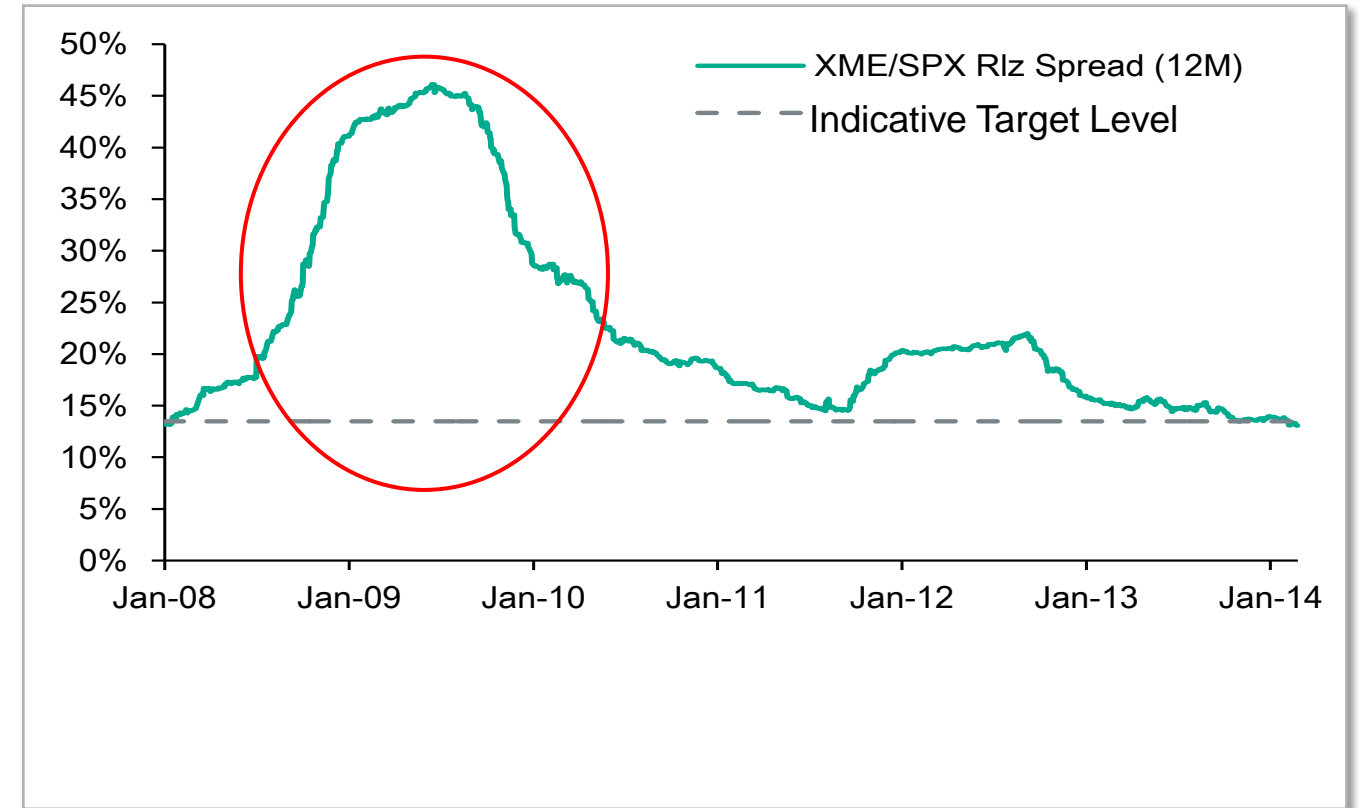
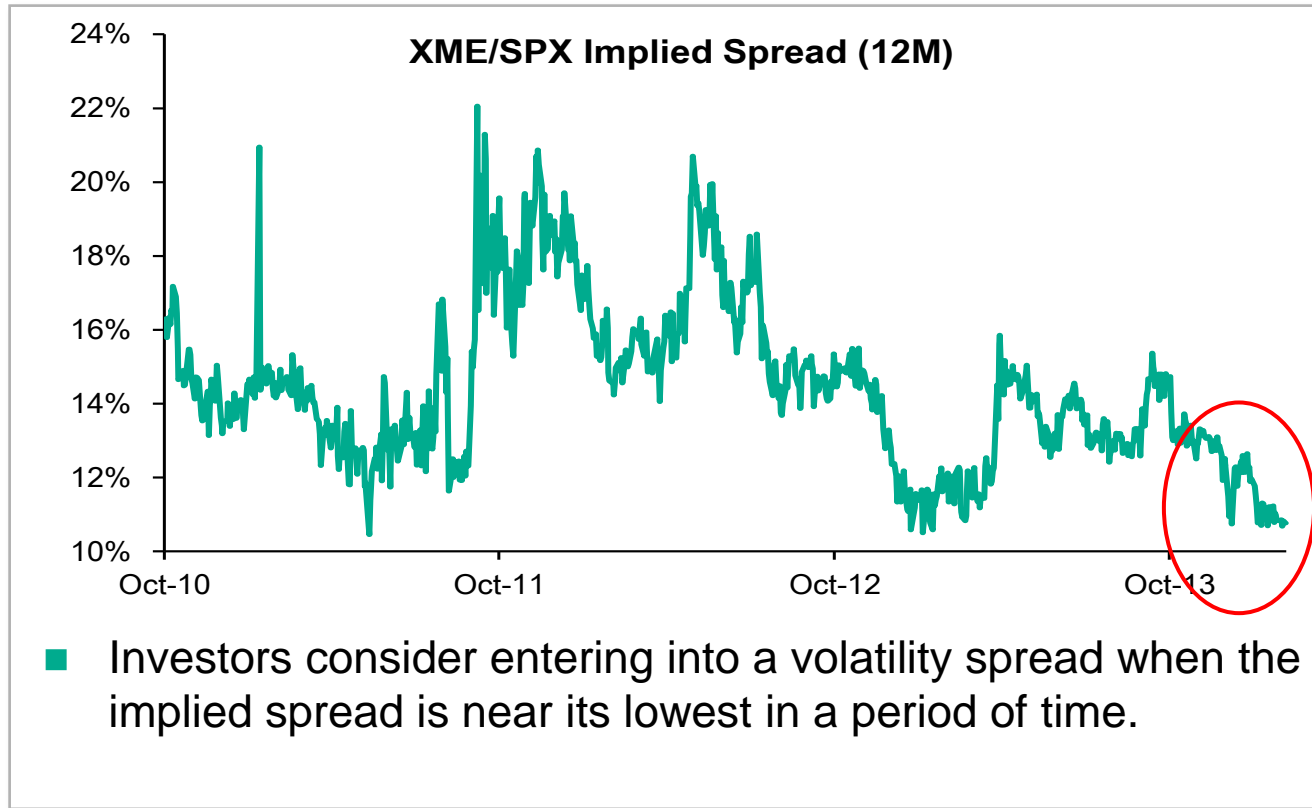
Put Fly Payoff



Source: BNP Paribas. Prices are indicative. As of 3/4/14. Reference VXX: 43.01.



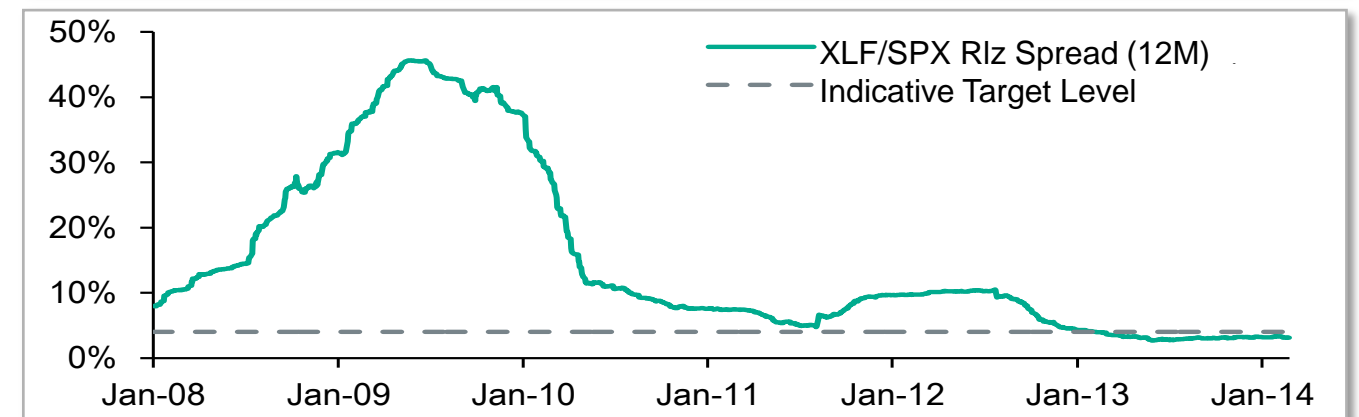
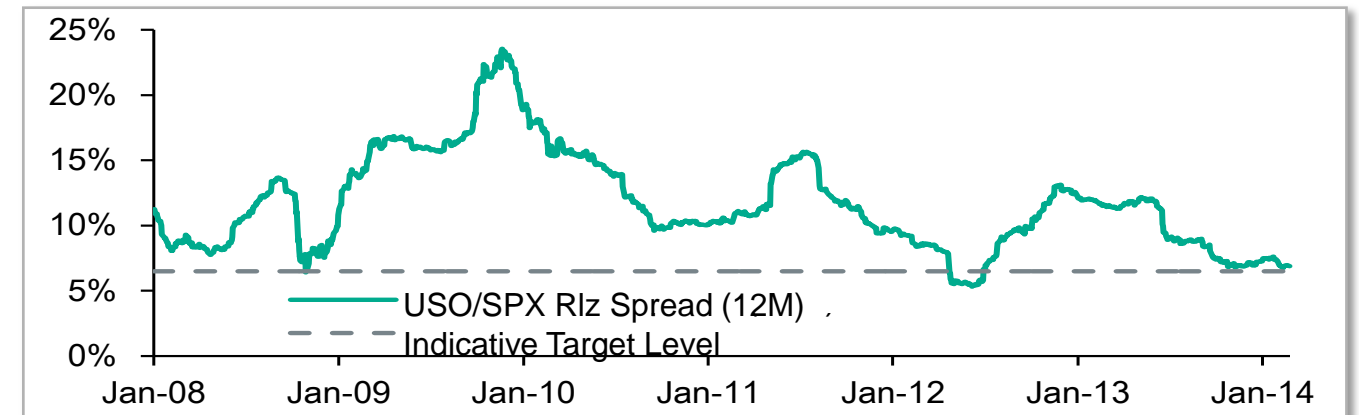
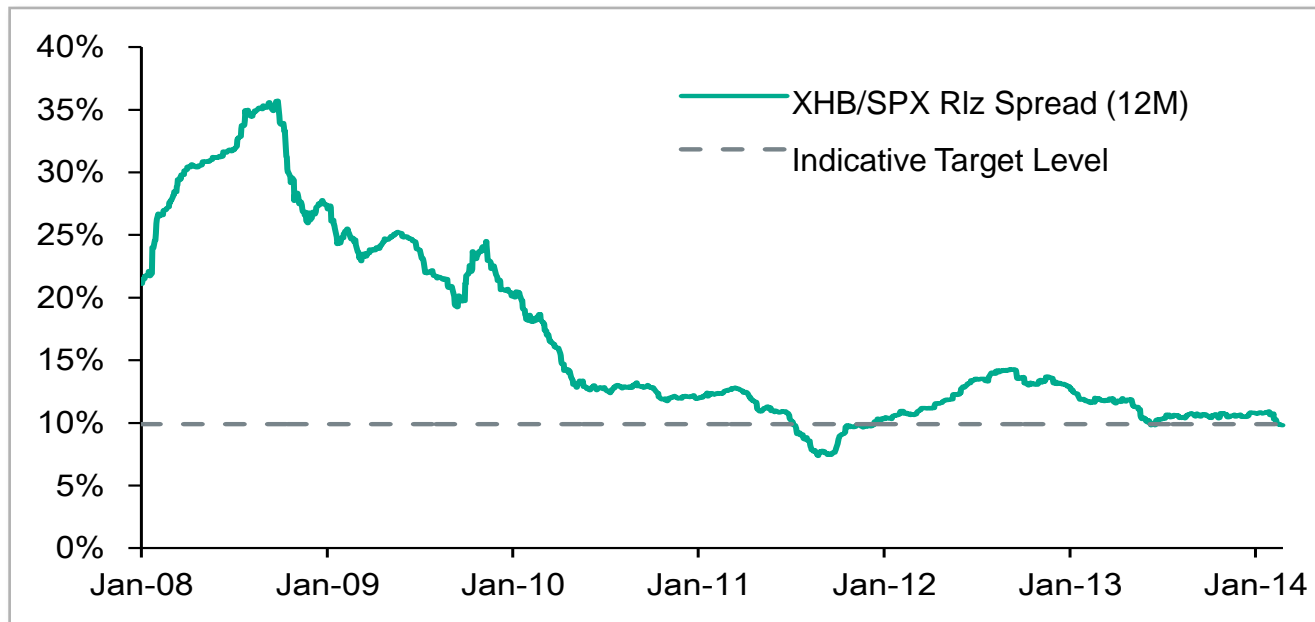
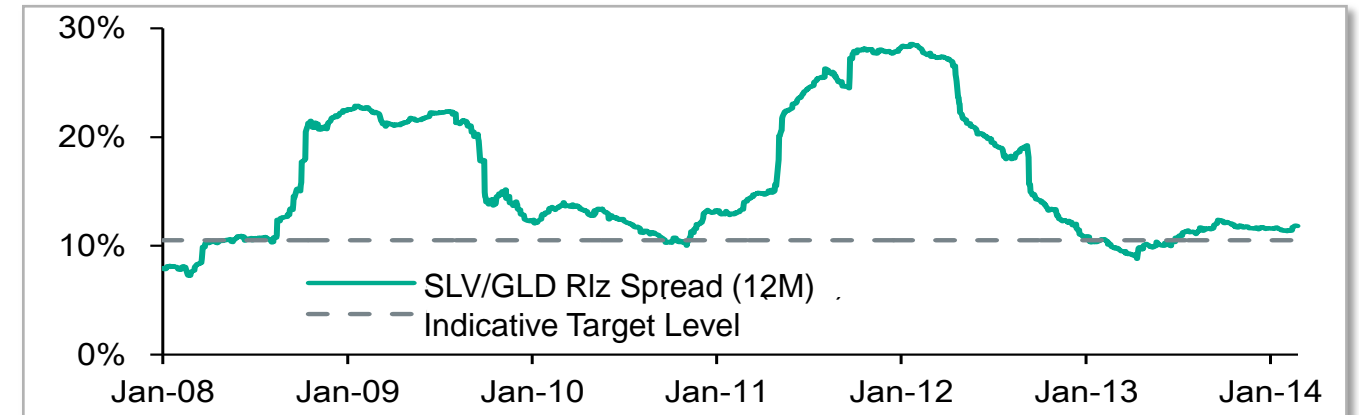
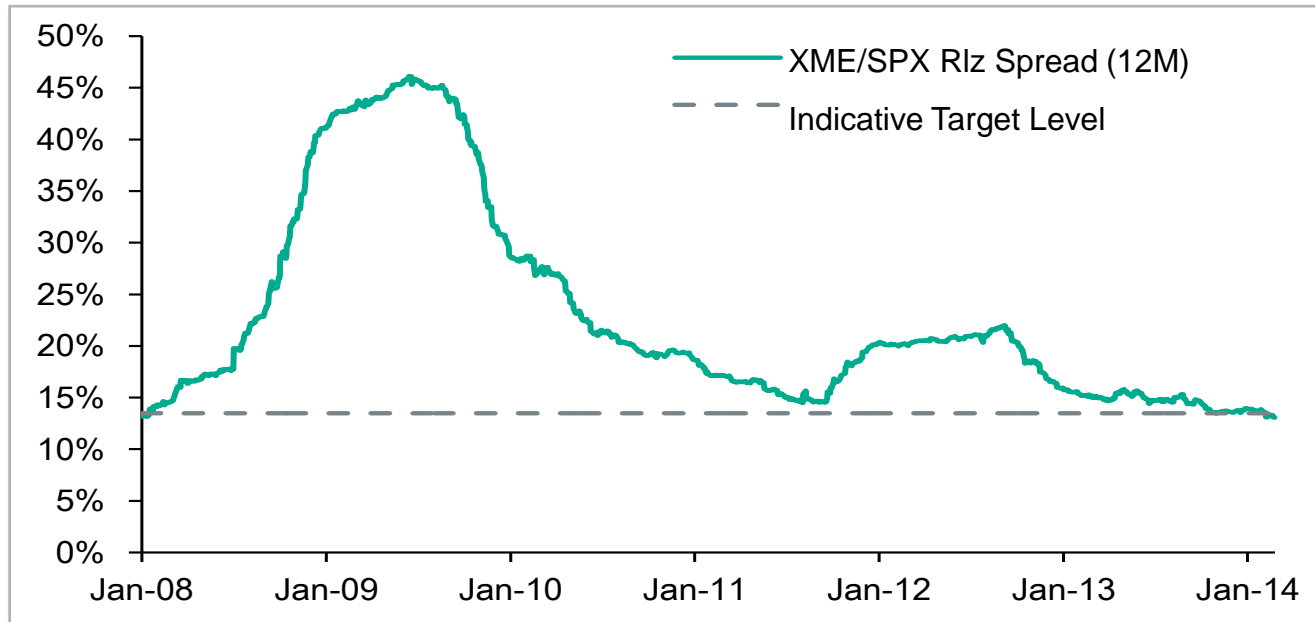
## RELATIVE VALUE: Variance Spread



Source: Bloomberg, BNP Paribas  
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# RELATIVE VALUE: Variance Spread



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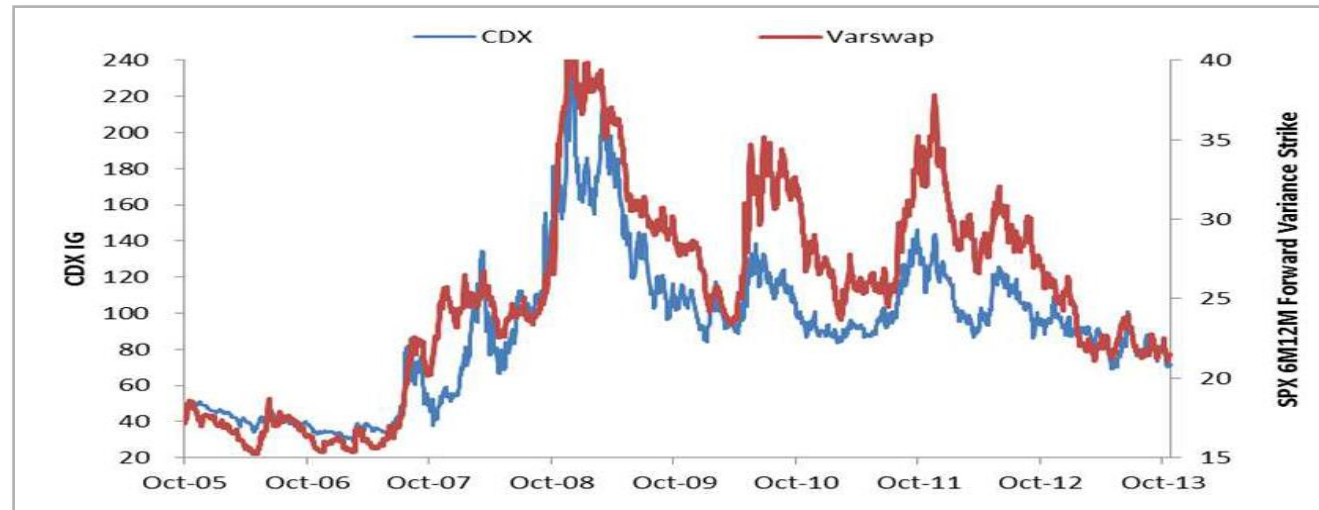




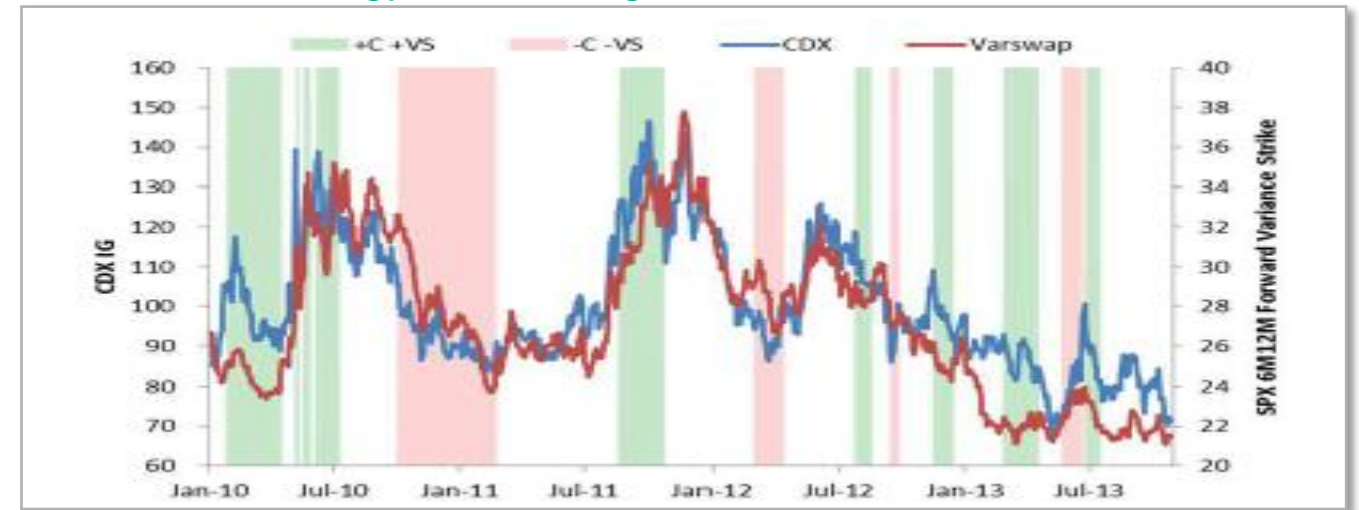
# VOL ARBITRAGE: Credit vs Variance

By analyzing the spread between credit and equity volatility, we can pinpoint carry trades across asset classes as well

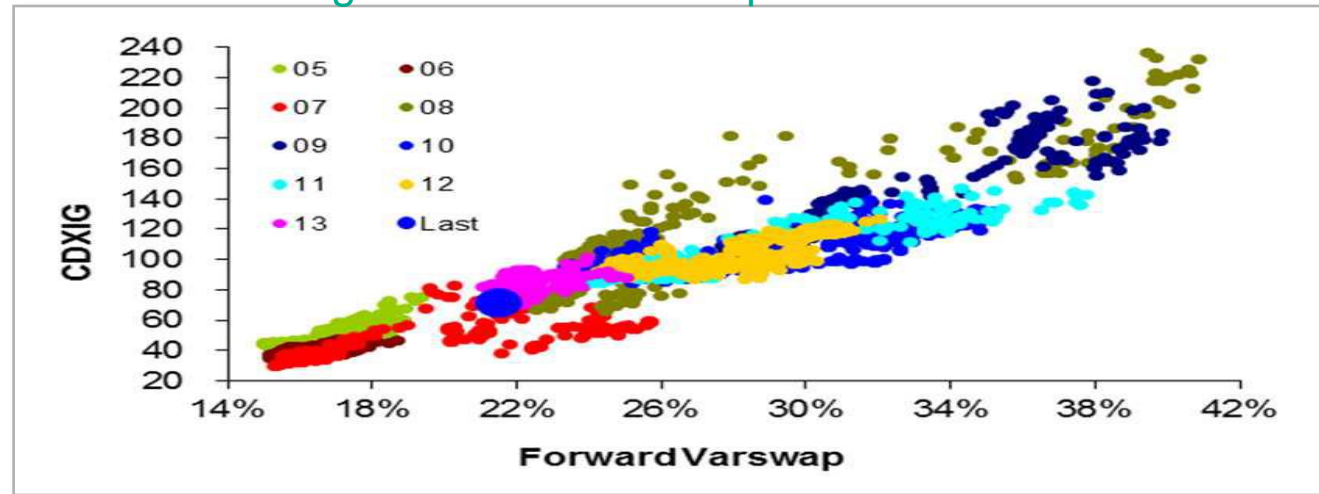
## CDX vs SPX Variance Historical Levels



## Simulated Strategy Positioning



## SPX 6m-Starting 12m Variance Swap Strike vs CDXIG



- We exited the trade once the residual moved to 0. If a trade has been held for 3M (66 trading days) without the residual moving to 0, we exit the trade immediately
- For trade sizing, we took a \$100mm notional position in the CDX IG index against a roughly \$175k vega notional position in the variance swap. We calculated the sizes by using the betas below and assuming a duration of 4.75.
- One SD move in residual (8bps) results in a P&L change of

	Avg	Med	SD	Max	Min
Rolling Beta Res	-0.2	-1.2	8.8	30.1	-19.4
Constant Beta Res	-0.4	-0.6	7.7	32.6	-20.3

Sources: Bloomberg, BNP Paribas

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- No Vol 101 anymore
  - Very sophisticated and knowledgeable investors
  - Good information and liquidity
  - Multiple Behaviors
- Equity Vol
  - Not for equity managers only
  - Remains reliable reactive hedge



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