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VIX Hedging
September 30, 2015

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Hedging objectives

What is the "best hedge"?

- Are we protecting against the next 2008 or a garden variety selloff?
- How consistent are we? Discretionary vs. systematic hedging
- How much are we willing to lose on hedging?
- Are we protecting a given level of S&P or a drawdown from the highs?
- Am I trying to hedge against volatility or hedge against permanent losses?
- Are we trying to make money from hedging or reduce losses?
- Are we trying to time a downturn?

The answer to all of these questions will determine how/if we hedge.

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Market rallying: S&P puts can quickly become irrelevant

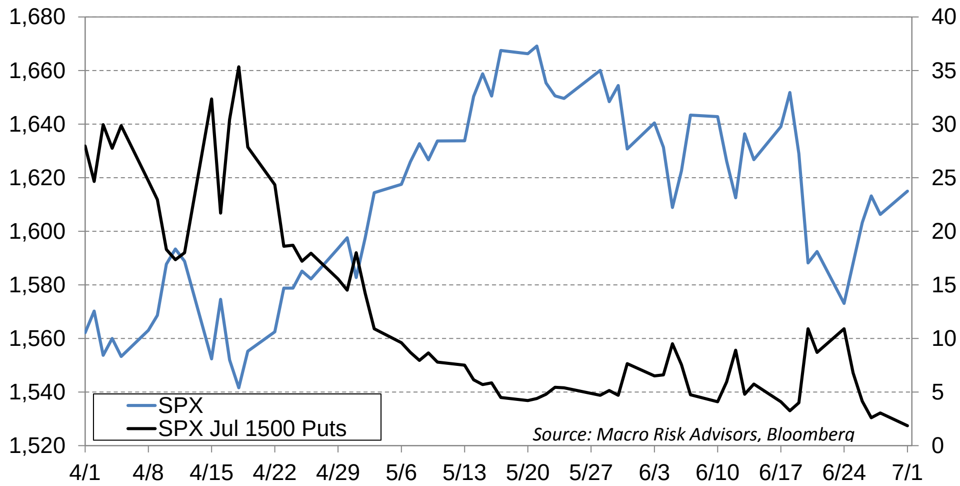
- Losing money on delta
- VIX calls will also 'roll down', but in some sense stay more relevant
- 20 VIX is "always in play"

Example: April – June 2013

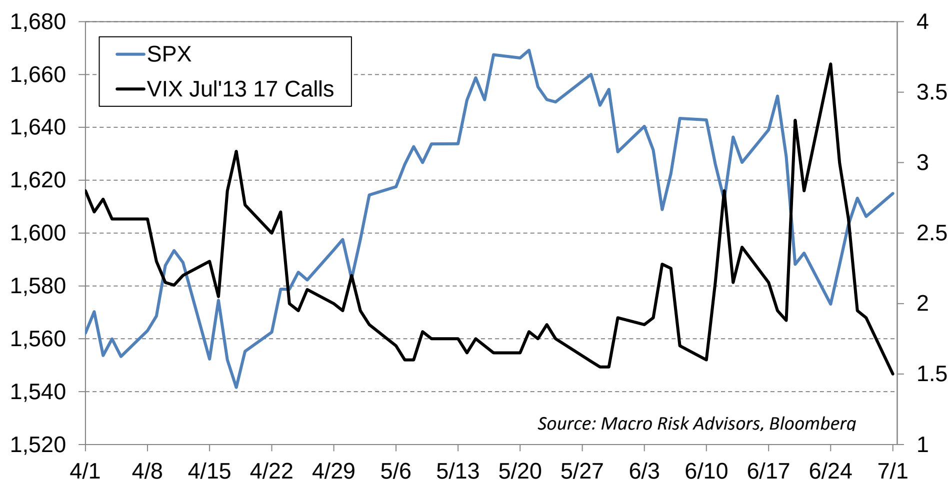
- Market rallied
- SPY July puts became irrelevant due to the market rally
- VIX July calls remained a useful hedge

VIX calls are 'always in play' but more expensive to reflect this jump risk

SPX vs. SPX Jul 1500 Puts, Apr - Jun 2013



SPX vs. VIX Jul 17 calls, Apr - Jun 2013



VIX vs. S&P

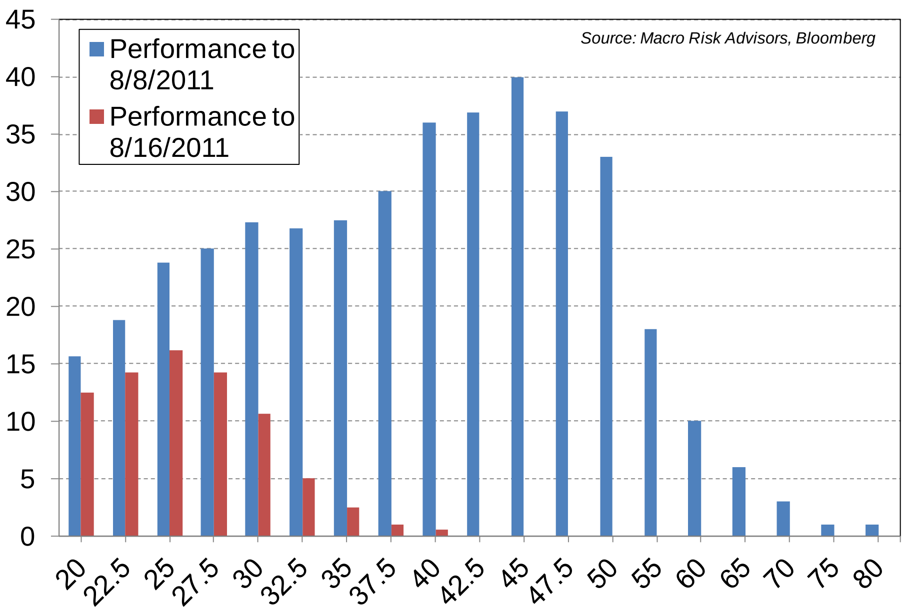
S&P puts can be more reactive than VIX calls in an equity selloff

- S&P puts trade at a much lower vol than VIX calls
- Near-dated, far out-of-the-money S&P puts (tail puts) can be extremely reactive

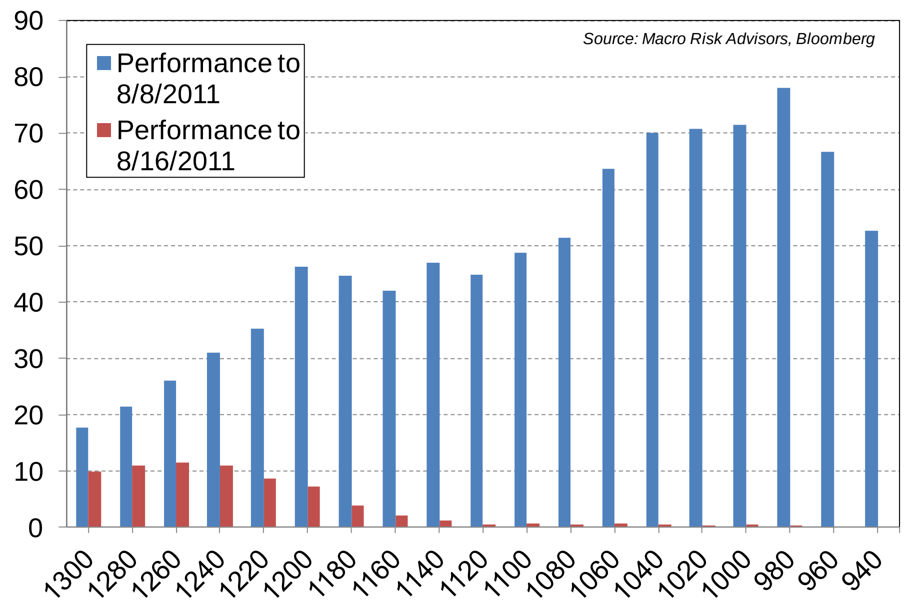
Example: August 2011

- S&P puts were more reactive in the initial selloff
- However, they decayed rapidly when the market stabilized
- Teeny puts may not be useful in a lesser selloff

VIX Aug '11 Calls performance from 7/22/11



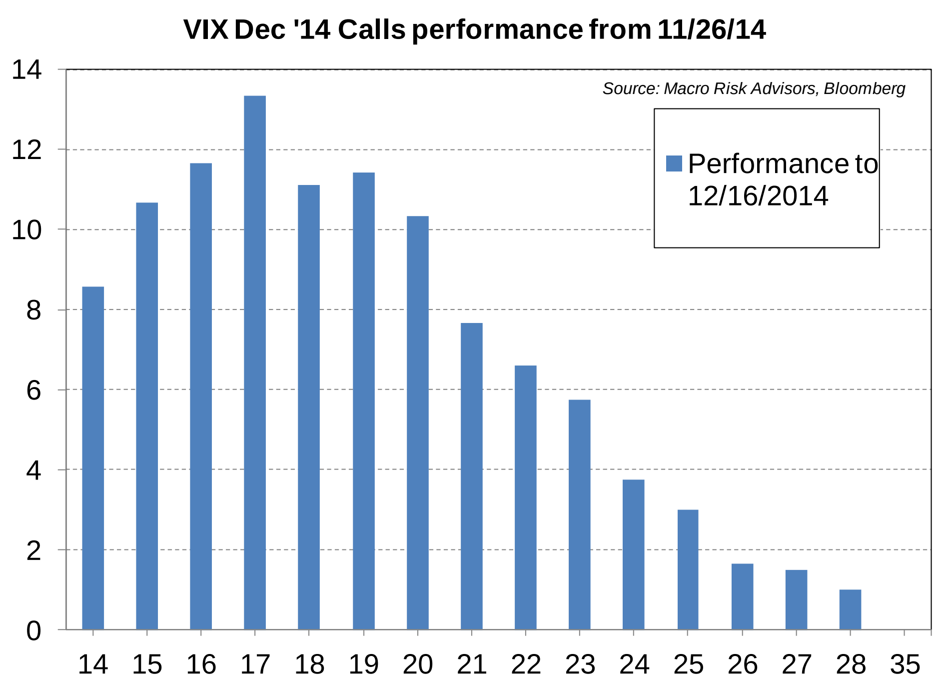
SPX Aug '11 Puts performance from 7/22/11

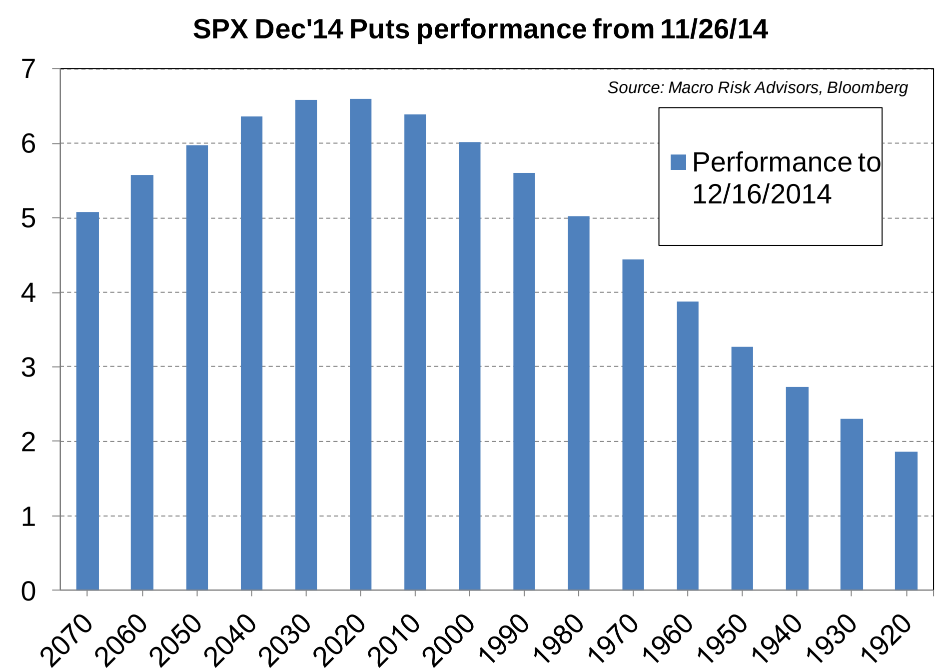


VIX can sometimes be more reactive than S&P (e.g. credit selloff)

Example: Dec 2014 (11/26/14 – 12/16/14)

- Dec VIX futures went from 14.20 to 23.10
- HYG declined by 5%
- SPX declined by 4.8%
- Generally rare for VIX to react without SPX reacting





VIX calls vs. S&P puts

VIX Calls

Advantages
- VIX is "always in play"
- Can sometimes be more reactive than S&P

Disadvantages
- Higher vol premium
- Higher decay/roll cost
- Can decay away from strike
- Less reactive in a severe equity selloff

S&P Puts

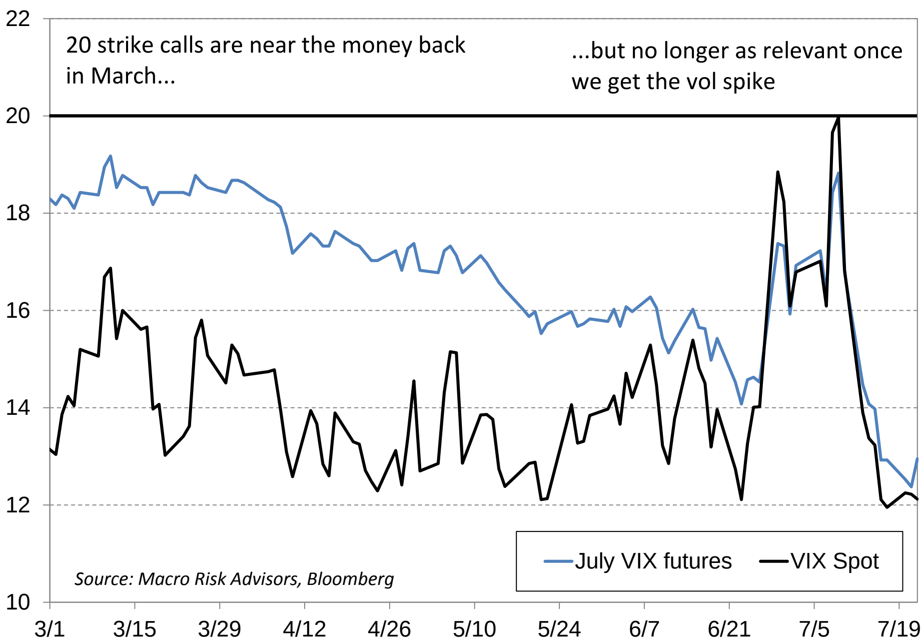
Advantages
- Lower vol
- Higher reactivity in an equity selloff
- Direct hedge to long equity book

Disadvantages
- Can rally away from strike
- Sometimes less reactive than VIX

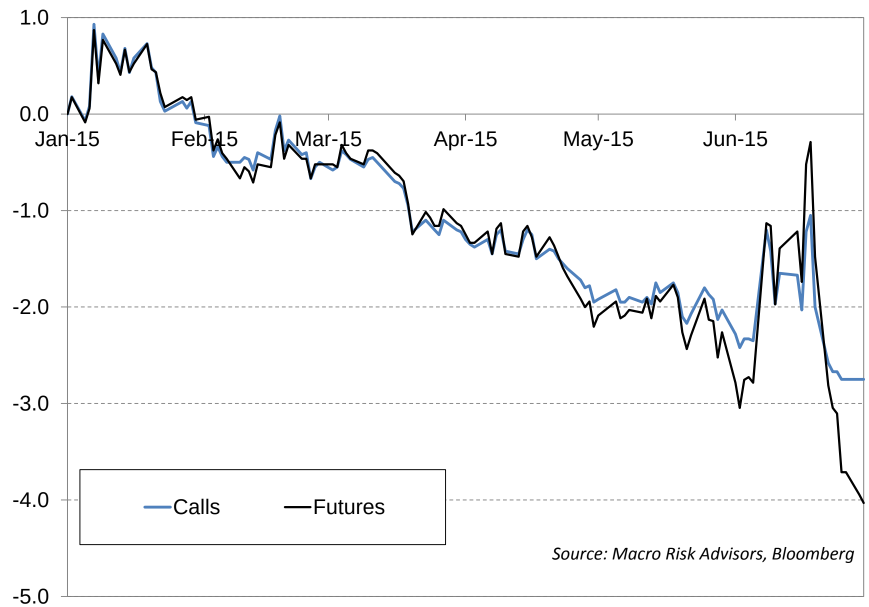
VIX calls vs. VIX futures

- VIX futures already have option-like P&L profile
- Buying VIX calls is like buying "calls on calls": long "vol-of-vol"
- VIX call underlying is VIX futures, not spot VIX
- VIX calls: sliding away from strike as underlying VIX future "rolls down"
- VIX calls may be easier to size & manage (pre-defined cost)
- VIX calls tend to be bad hedges when VoV is already high

July VIX Futures vs. VIX Spot

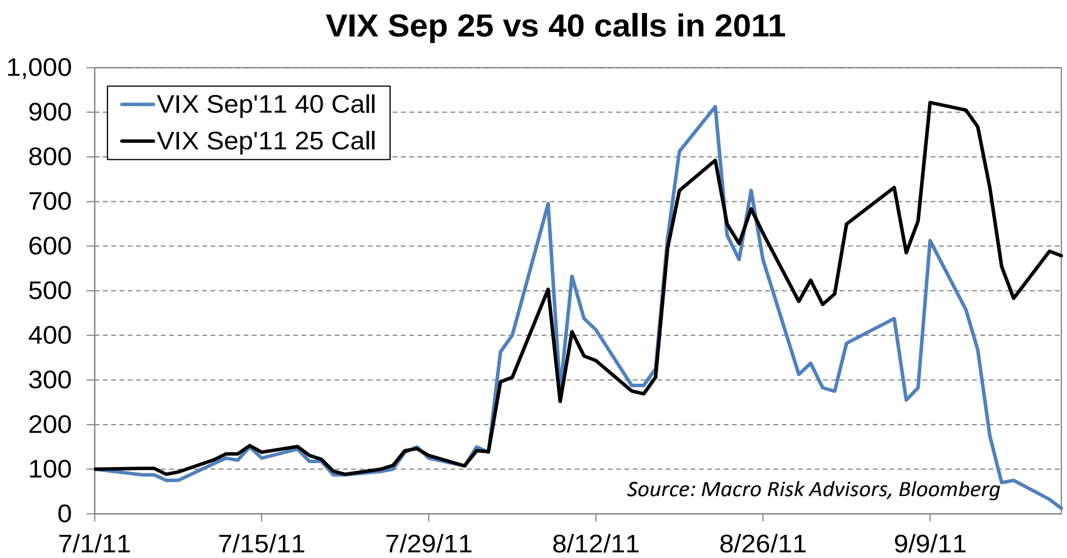


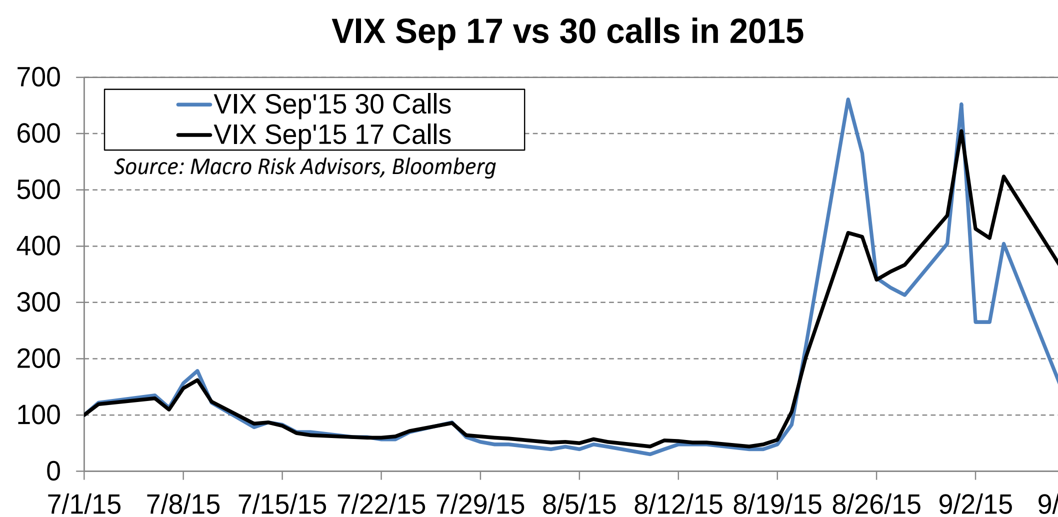
VIX July 20 Calls vs. VIX July Futures (Same Initial Delta)



Outright VIX calls: Strike selection

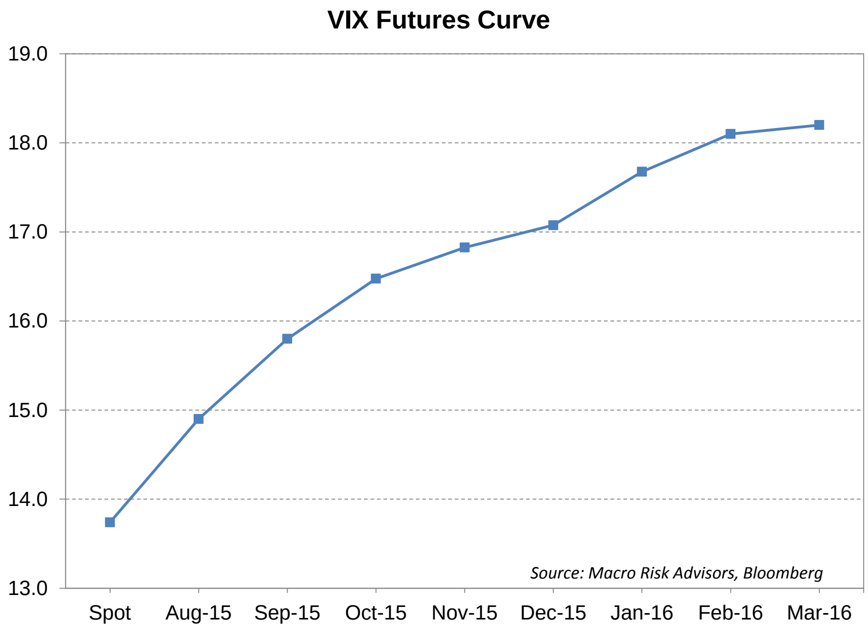
- OTM VIX calls will outperform on a large vol spike
- The faster and bigger the vol spike, the more the OTM VIX calls outperform
- However, you need to nail the unwind exactly right
- Near-the-money VIX calls have a better chance of retaining their value on a vol spike
- This only applies if we hold our VIX calls all the way to expiry
- Will we be able to hold a VIX call that goes in the money?

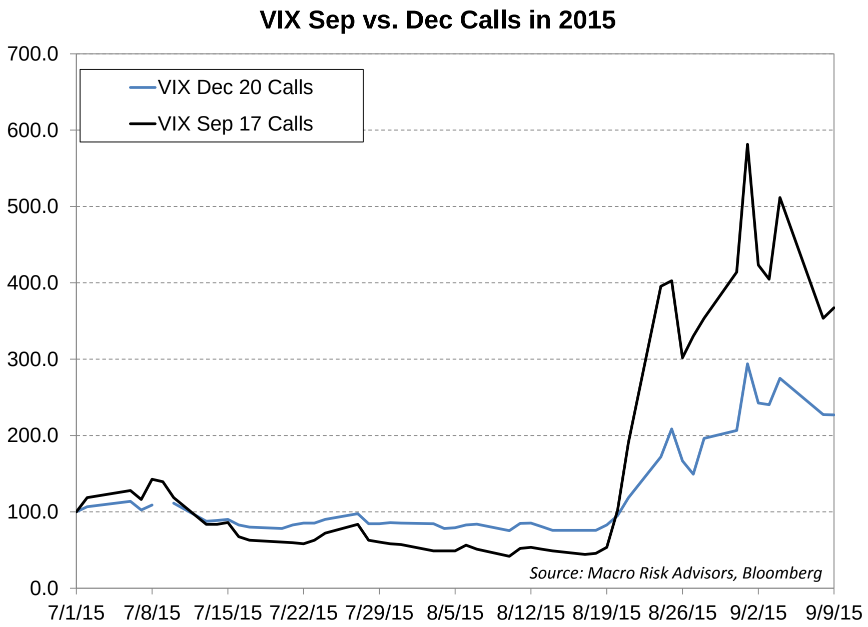




VIX calls: Maturity selection

- Should we buy near-dated or long-dated VIX calls?
- Long-dated VIX calls: need to pay option time premium and curve premium
- Long-dated options less reactive
- If we think vol spikes "sometime" but don't know when or by how much, we have no idea of the potential losses and can't calculate risk/reward
- For hedgers, almost always makes more sense to roll near-dated options
- Very low and flat VIX curve could make long-dated VIX calls interesting

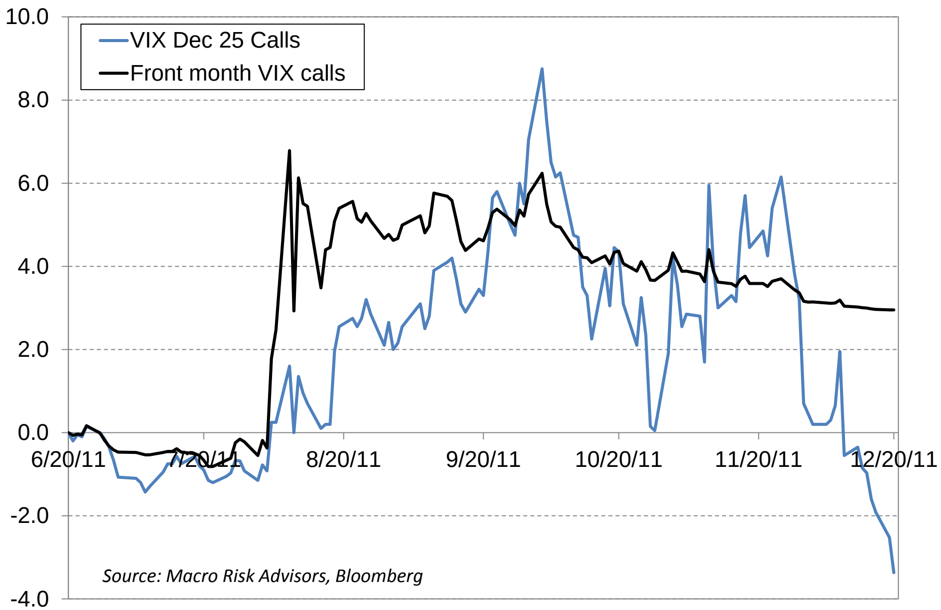




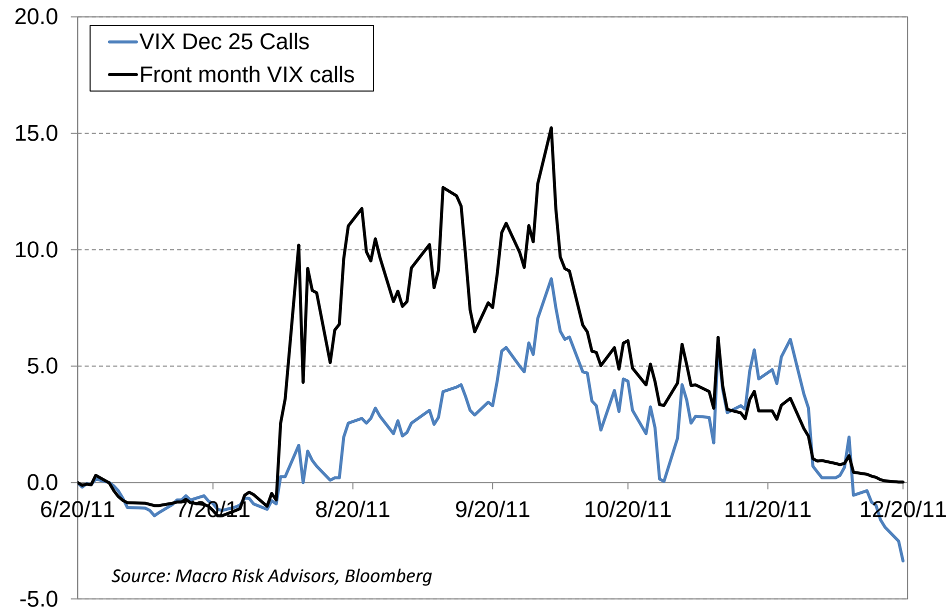
VIX calls: Maturity selection

- Should we buy a long-dated option or roll several short-dated options?
- Sizing: Do we budget rolling costs? Are we trying to optimize cost or hedge effectiveness?
- Fixed monthly budget: known cost, but limits how much hedge we can buy (esp. after vol spike)
- Fixed position: unknown cost, but known vol exposure

VIX Dec 25 calls vs. rolling front month VIX calls in 2011 (Fixed Monthly Budget)



VIX Dec 25 calls vs. rolling front month VIX calls in 2011 (Fixed Position)

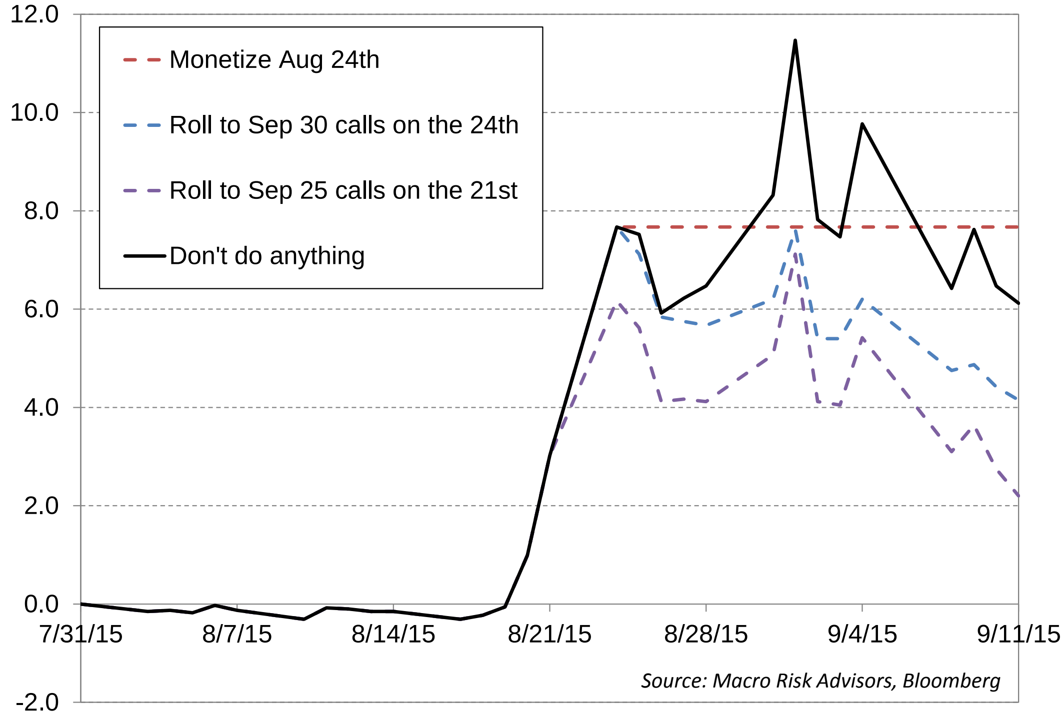


VIX calls: Monetizing

Should we try to monetize our VIX calls?

- VIX vol of vol spikes after the initial move (making VIX calls good sales and expensive buys)
- VIX calls can decay very quickly after the initial move
- Extremely difficult to time the "top"
- Are we OK with limiting further gains?
- Is it worth paying the premium to roll to further OTM VIX calls?
- Example: VIX Sep 17 calls over the past few weeks

P&L of VIX Sep 17 calls

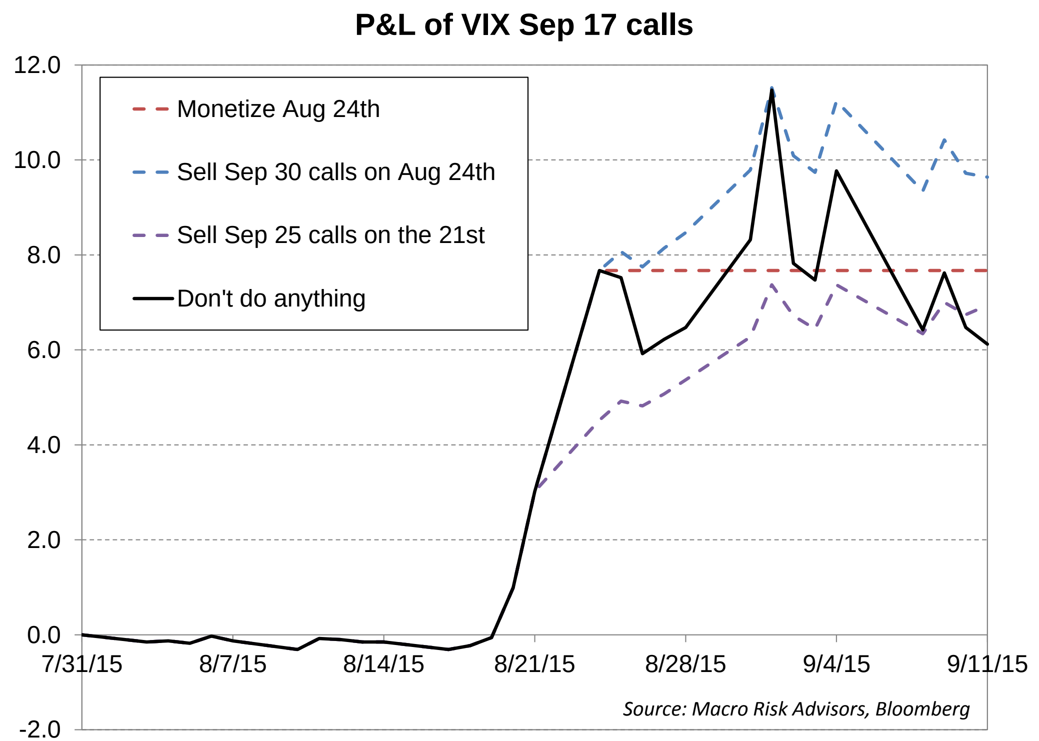


Source: Macro Risk Advisors, Bloomberg

VIX calls: Monetizing

Turn VIX calls into call spreads

- Maintain exposure to higher VIX
- Take in premium and sell high vol-of-vol
- Timing still matters, but is more forgiving than taking off the hedge entirely
- Example: Selling Sep 25 and Sep 30 calls against Sep 17 calls over the past few weeks



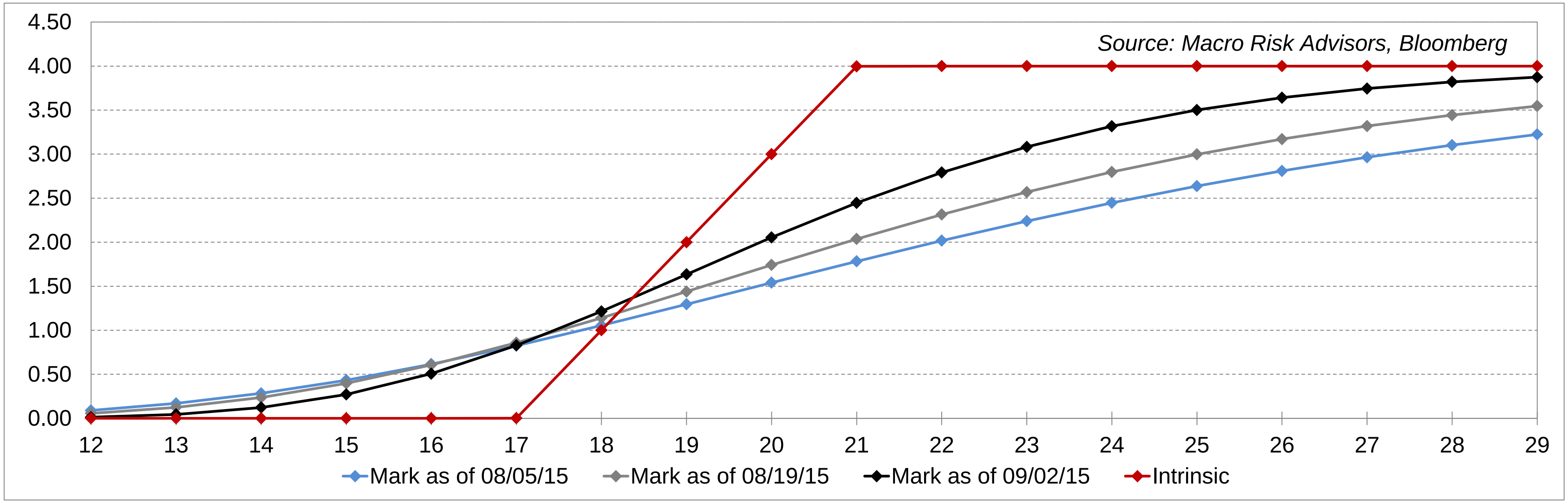
Takeaway

- It's difficult to time the top
- Rolling into higher strike VIX calls is extremely expensive (only makes sense if we expect a serious increase in volatility, e.g. 2008 scale)
- Selling VIX calls helps us keep exposure to higher VIX and sells high vol-of-vol

VIX Call Spreads

- VIX call spreads are rarely worth their full value before expiry
- Selling the top strike lowers the initial cost but reduces the convexity
- Can be useful if you specifically expect a jump in VIX right before expiry
- Useful if you have a fixed dollar amount to protect
- Bid to vol-of-vol may result in disappointing marks when we reach the top strike (since we are short it)

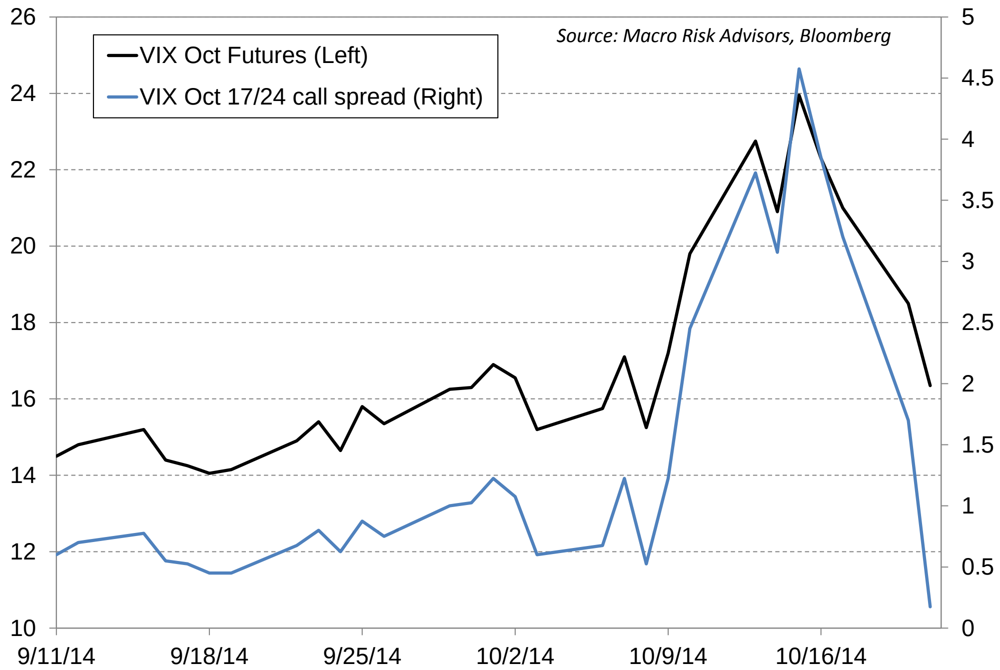
Sep VIX 17/21 call spread (as of Aug 5th)



VIX Call Spreads: Historical example

- In Oct '14 the VIX Oct futures closed at 24 for one day, before collapsing
- The VIX Oct 17/24 call spread was only worth $4.50 mid (out of a total $7) with only a week to expiry
- We should never expect call spreads to be worth full value unless
  1) We way overshoot the top strike
  2) We expect to be at or above top strike right before expiry (and are OK w/ waiting for this)

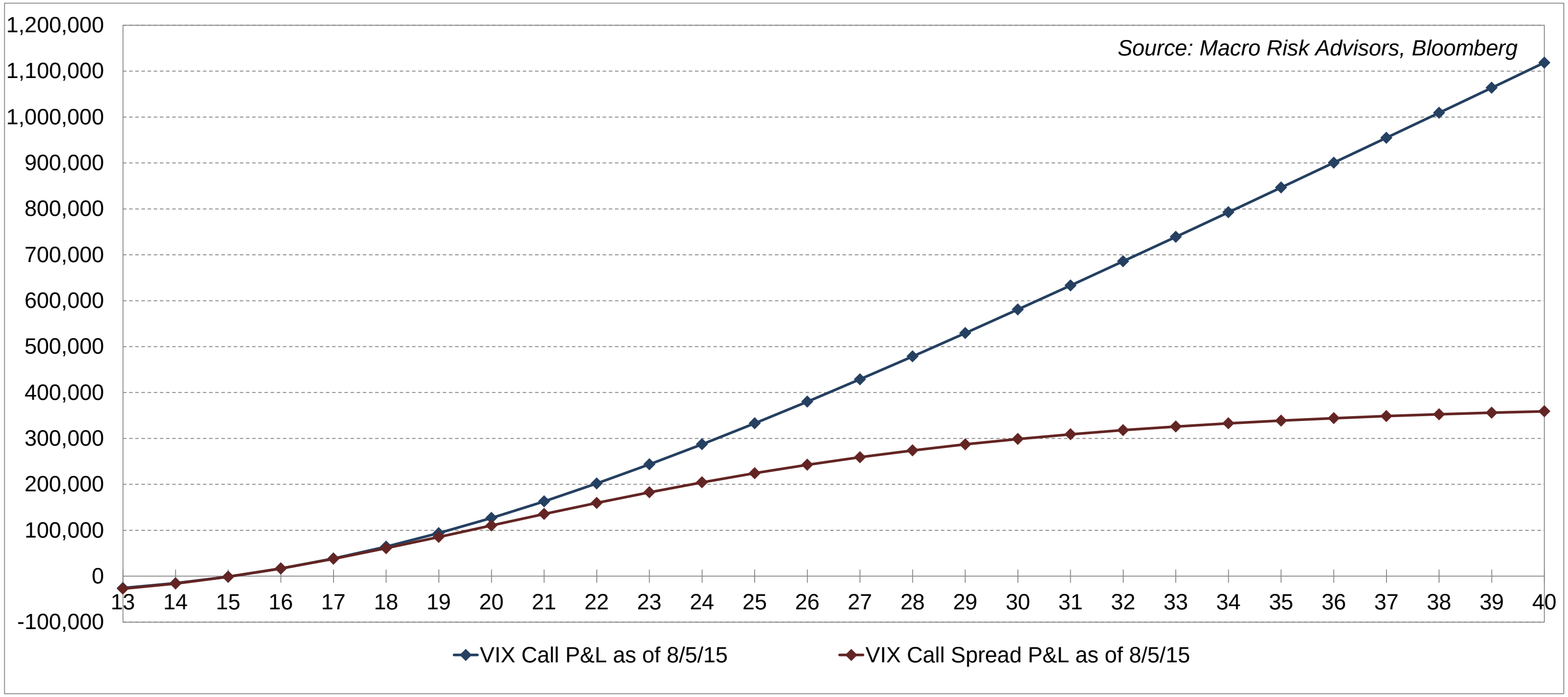
VIX Oct'14 17/24 call spread vs. Oct '14 Futures



VIX Call Spreads vs. VIX calls

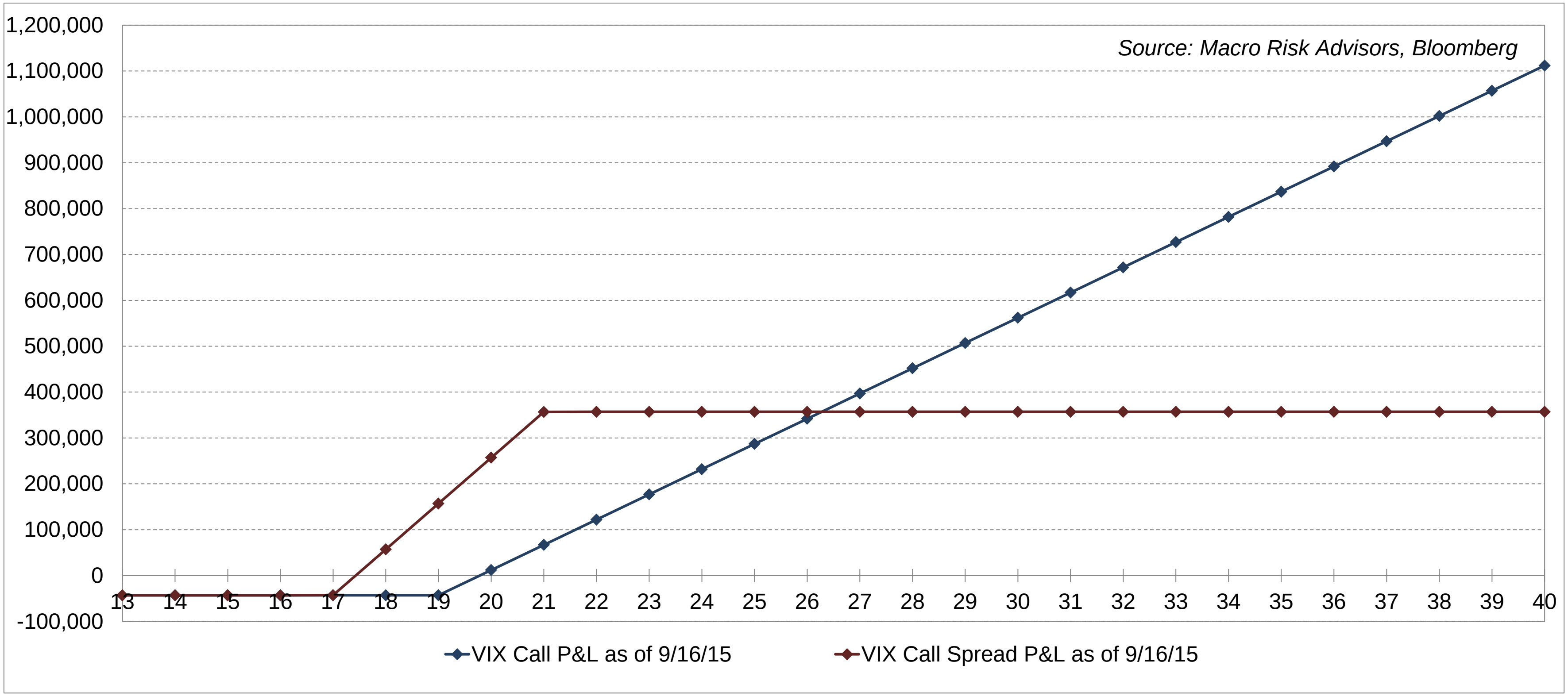
- VIX calls are more expensive per contract, but you need less
- For an instantaneous move, the same dollar premium of calls will be much more reactive

VIX Sep 19 calls vs. VIX Sep 17/21 call spread (same dollar premium), instant P&L as of Aug 5th



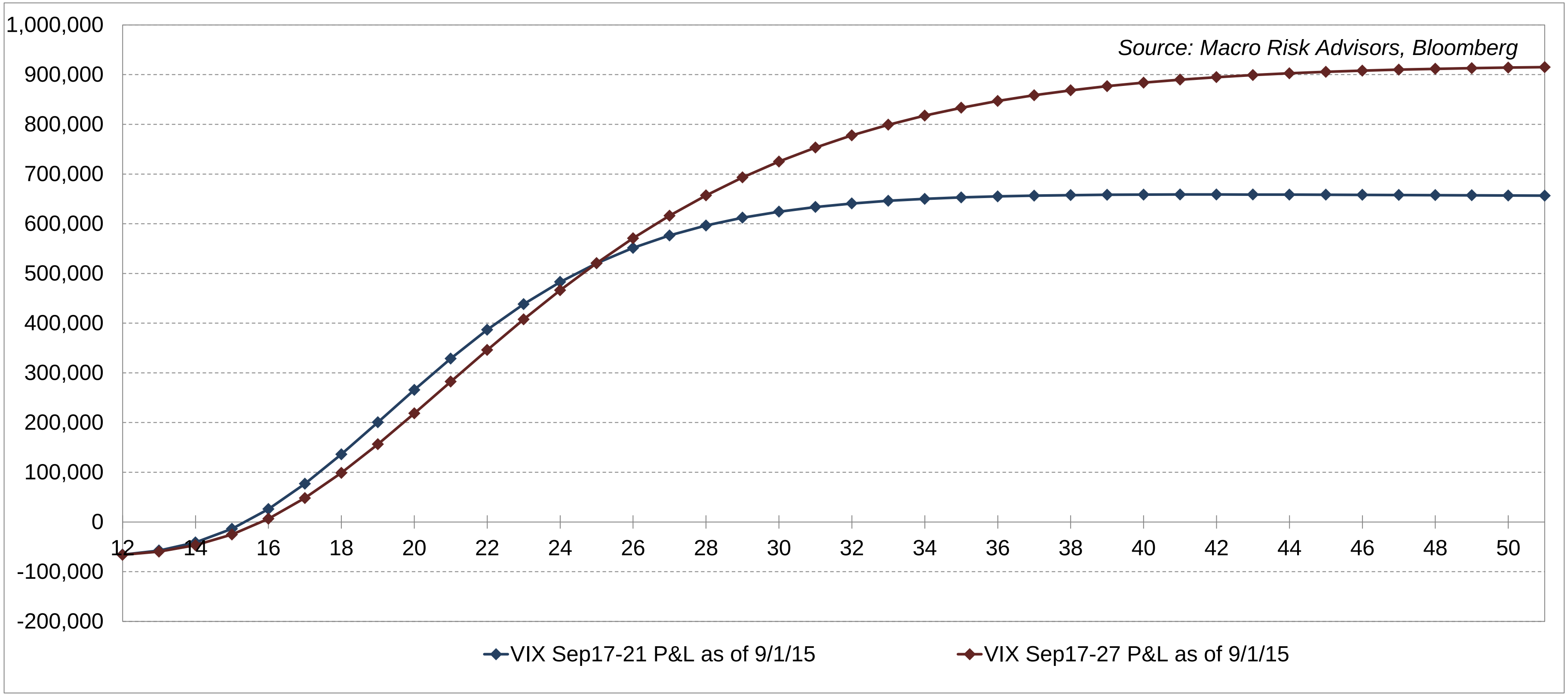
VIX Call Spreads vs. VIX calls

- We need to hold VIX call spreads all the way to expiry to realize their full value
- Impractical hedge if our objective is immediate gains on a move lower
- Good if we don't care about monetizing or rolling before expiry
- Good for targeting a specific event right before VIX expiry



VIX Call Spreads: Strike Selection

- Tighter call spreads have better decay, but limit our upside
- Wider call spreads have heavier decay, but give us more upside



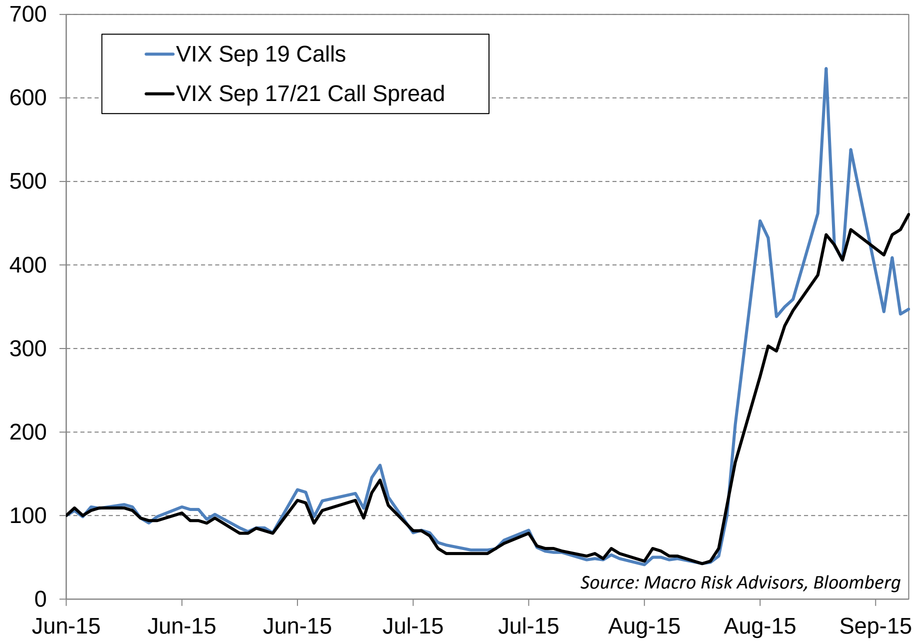
VIX Call Spreads: Historical Examples

In both examples we compare equal dollar premium of calls to call spreads. The calls are more expensive initially, meaning we have fewer contracts of the calls.

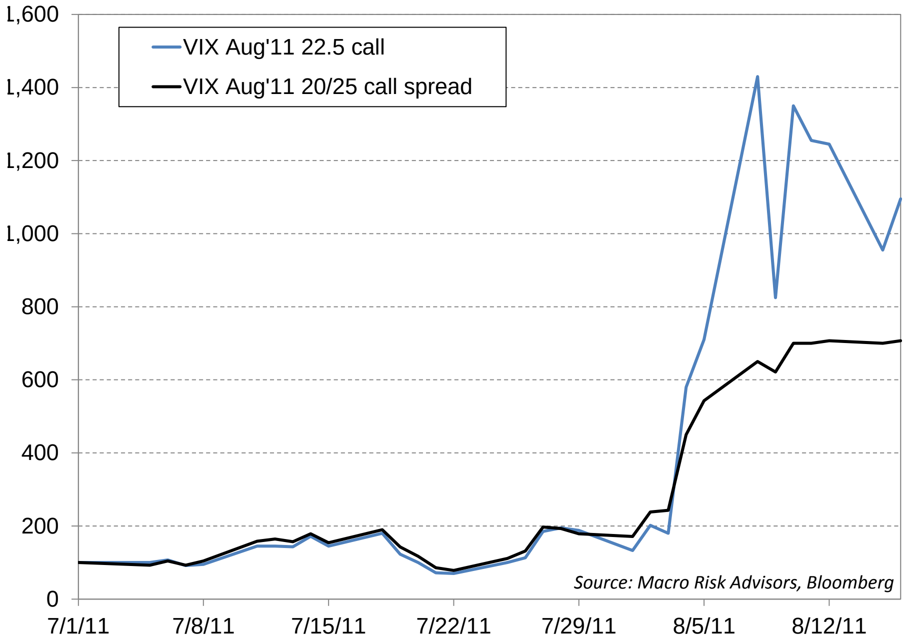
Sep 2015: The calls outperform the call spread on the initial leg down and retain exposure to further increases in volatility. As time goes on, they decay more quickly.

Aug 2011: The calls massively outperform the call spread, whose P&L is capped.

VIX Sep 19 calls vs. 17/21 call spread in 2015



VIX Calls vs. Call Spreads in Aug 2011



VIX calls vs. VIX Call Spreads

VIX Calls

Advantages
- More reactive on initial move
- Unlimited upside

Disadvantages
- Faster decay
- May be initially more reactive, but if we monetize it, we cap the gains anyway

VIX Call Spreads

Advantages
- Slower decay

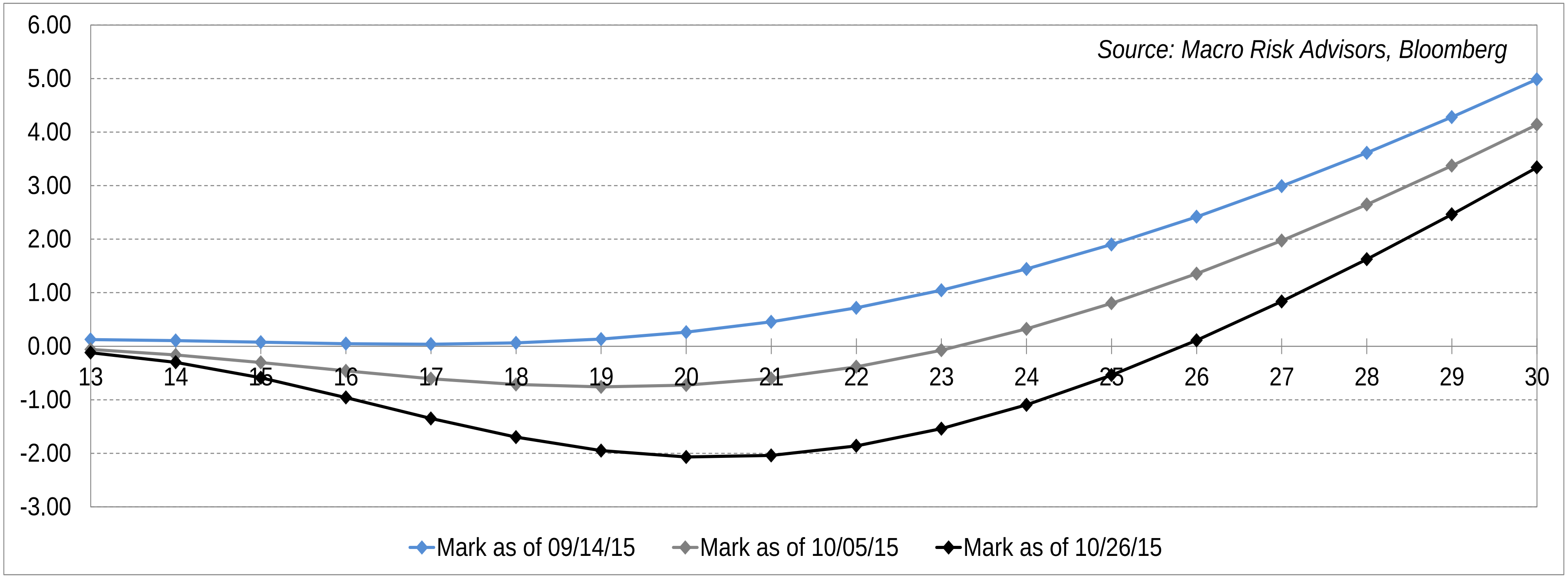
Disadvantages
- Less reactive on initial move
- Limited upside

Other structures

VIX 1x2 call spreads

Sell 1x near strike call, buy 2x higher strike call

- Decay can be fairly minimal if nothing happens (stay near bottom strike) – need to roll before expiry
- Decay becomes very high if we get to the upper strike
- Long vol-of-vol (which tends to expand during a selloff / vol spike)
- Needs to be quickly monetized on a vol spike – difficult to time the top

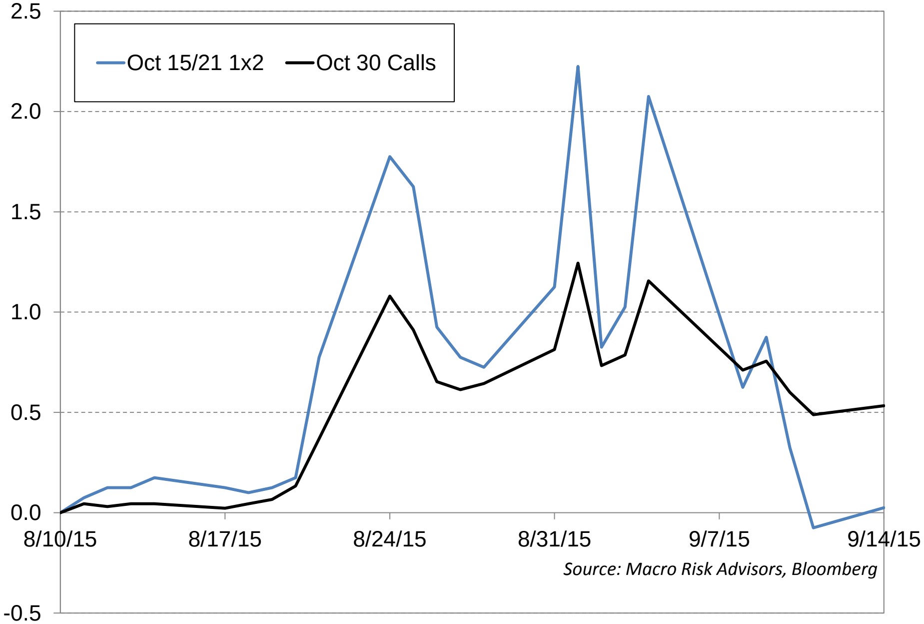


Other structures

VIX 1x2 call spreads – historical examples
Comparing the 1x2 call spread to a far OTM call sized to have equal decay

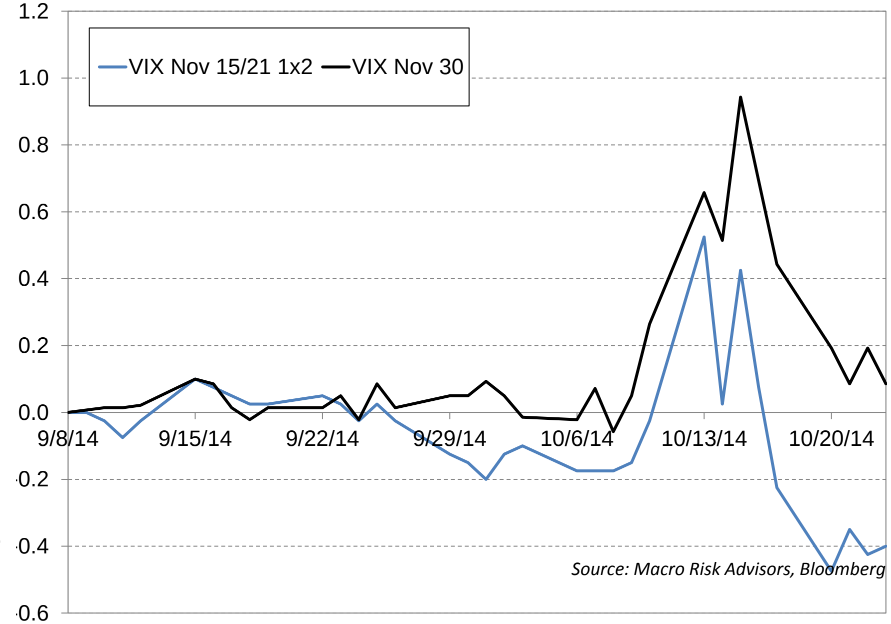
- There has been a buyer of the 3-month 15/21 1x2 call spread ~7 days to expiry (e.g. buy Oct structure before August expiry)
- Oct 15/21 worked well during the recent volatility, but decayed quickly – needed to monetize fast
- VIX calls retained their value better over time
- Last year, Oct 2014: window for monetizing the 1x2 was very short, underperformed the VIX calls

Oct 30 calls vs. Oct 15/21 1x2 call spread in 2015



Source: Macro Risk Advisors, Bloomberg

VIX Nov 15/21 vs. VIX Nov 30 calls in Oct '14



Source: Macro Risk Advisors, Bloomberg

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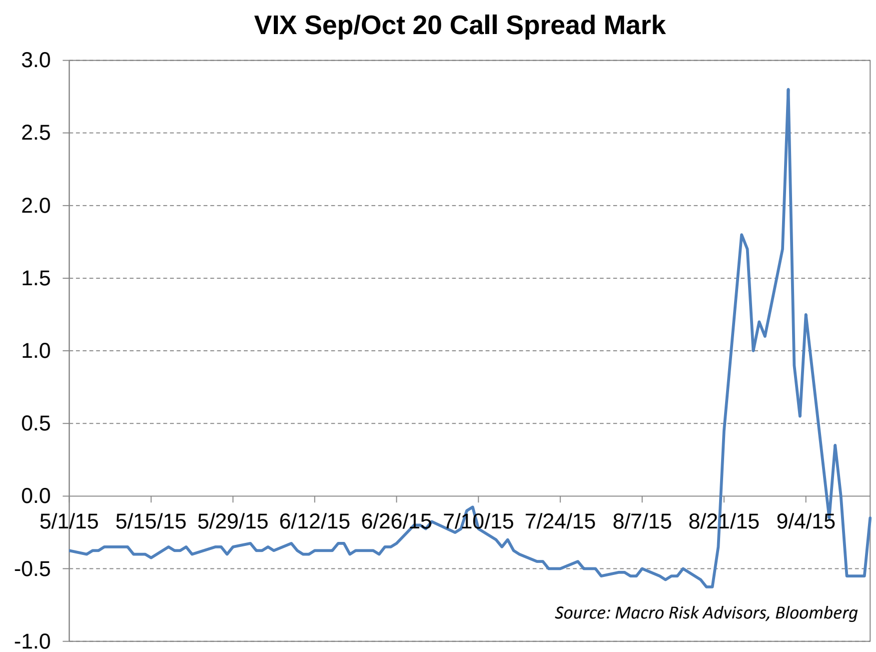
VIX Calendar Call Spread

Buy 1x near dated call, Sell 1x longer dated call

- Similar to owning an option on the curve steepness / flatness
- Can be initial credit or even money, but will decay
- Curve flattening goes hand-in-hand with vol increasing
- Should be unwound before expiry to avoid the worst case scenario decay (long worthless front month option and short ATM back month option)
- Should be quickly monetized to avoid decay



Summary

- There’s no best hedge for everyone
- VIX calls can be a more persistent hedge than S&P puts when the market is rallying
- Far out-of-the-money VIX calls can be more reactive, but can vanish more quickly
- Near-dated VIX calls are more reactive than long-dated VIX calls
- Rolling near-dated VIX calls is usually a better hedge than long-dated VIX calls
- Rolling into higher strike VIX calls after vol spikes is very expensive
- Selling VIX calls can help us monetize VIX calls while keeping long vol exposure
- VIX calls may be optically more expensive than call spreads, but are more reactive on a dollar-for-dollar basis