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$XIV Volpocalypse – A Sea of Disinformation and Misunderstanding

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If you follow the stock market or the volatility market, you probably saw what happened on Monday afternoon when the VIX volatility index exploded higher, stocks tanked lower, and the $XIV Credit Suisse Velocity Shares Inverse VIX ETN imploded in spectacular fashion. I'm writing this post because even now, a few days later, I continue to see grossly ignorant explanations of what happened being spread around and praised for their insight. Let's start at the beginning, shall we?
There are multiple kinds of ETPs (Exchange Traded Products).

ETFs (Exchange Traded Funds) are generally easy to understand: the ETF holds a basket of stocks (or something else), and there are APs (Authorized Participants) who can bring that basket of stuff to the issuer in exchange for new ETF shares, or bring the shares of the ETF to the issuer in exchange for the basket of stuff. This "creation/redemption" mechanism allows arbitrageurs to keep the trading price of the ETF very close to its NAV (net asset value). If the ETF trades rich (above NAV), the arbs will short the ETF, buy the basket of stuff, and create new shares by delivering the stuff to the ETF, closing out their short. If the ETF trades cheap (below NAV), arbs will buy the ETF, short the basket of stuff, and bring the ETF to the manager, receiving the basket of stuff to close out their short. Simple, right?

Then we have CEFs (Closed End Funds), which don't have this creation/redemption mechanism. Some of them have a provision where shares can be redeemed, sometimes only at specific fractions of NAV, but with CEFs there are no Authorized Participants who can create new shares to arb situations where the CEF trades rich to its NAV.
Finally we have ETNs (Exchange Traded Notes), which are debt instruments of an issuer, whose value is tied to some underlying formula based on the performance of specific assets. With ETNs, as with CEFs, it is often only the issuer who can create new shares to arbitrage situations where the ETN is

trading rich. Many ETNs also have redemption mechanisms where holders can deliver shares (in minimum block sizes) to the ETN in exchange for the underlying assets or value thereof.

Which brings us to the belle of the ball: $XIV: an ETN issued by Credit Suisse, whose performance is tied to the inverse of the daily change of a blended basket of VIX futures. In layman's terms, XIV is supposed to perform, on a daily basis, the opposite of how the underlying VIX futures basket performs. You can read the specifics in the prospectus if you like. Since the XIV aims for inverse DAILY returns, it must rebalance its underlying holdings every day. I wrote a lengthy post about the mechanics of similar rebalancing for a leveraged gold-miner ETF several years ago, but let's talk about XIV specifically, because the concept is actually pretty simple, and will illustrate how the Volpocalypse spiraled out of control.

$XIV had roughly 15mm shares outstanding, and an NAV of roughly $100/share before the SHTF. Let's call that $ 1.5B in exposure to short VIX futures. The XIV website shows the actual mix of FEB and MAR VIX futures that the XIV underlying is short – it usually ranges around 2/3rds 2nd month (MAR) and 1/3rd front month (FEB), but changes as they roll their futures and as the VIX curve shifts. As of the time of this writing it's 3/4 MAR and 1/4 FEB.

So XIV has $ 1.5B notional short VIX futures, and an NAV of $ 1.5B ($ 100/share). Now let's make up some numbers: Imagine what happens when the short VIX futures go up 40%. XIV now has $ 2.1B in short futures exposure, and and NAV of only $ 900MM (because it has lost $ 600MM on the short futures position). So what does the XIV manager have to do? He goes out and buys VIX futures to reduce his exposure and get it back in line with the NAV.

Herein lies the rub… As the XIV manager goes out and buys VIX futures, in massive size, in an illiquid volatility market, he drives the price up…which drives the NAV down… which requires him to buy more VIX futures… Rinse, repeat. This is why we saw VIX futures spike late in the day on Monday, and especially into the 4:15pm ET benchmark (times on these charts are Central time, fyi).


VIX Feb14'18 @CFE
755 Minutes/2 min bars
File
Edit
View
L: 20.7000 CH: -3.1500 CH%: -13.21% V: 114K
35.0000
33.7500
32.5000
31.2500
30.0000
28.7500
27.5000
26.2500
25.0000
23.7500
22.5000
21.2500
20.7000
20.0000
18.7500
17.5000
16.2500
15.0000
VIX FEB'18 Futures@CFE
Prior Close
Volume
5.0K
2.5K
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
'Feb 1
'Feb 2
'Feb 4
'Feb 6
'Feb 7

So, the ETN's own rebalancing creates negative convexity – where its own executions drive the price to a level where it must continue to buy more, higher – a vicious feedback loop. The XIV prospectus describes it thusly:

Daily rebalancing of the leverage amount may impact trading in the underlying futures contracts

The daily rebalancing of the leverage amount of each ETN back to its target may cause us, our affiliates, or third parties with whom we transact to adjust their hedges accordingly. The trading activity associated with these hedging transactions will contribute to the trading volume of the underlying futures and may adversely affect the market price of such underlying futures.

And finally we come to the coup de grace – the termination event: the ETN issuer has the right to terminate the product – accelerate redemption of it – if the underlying index moves more than 80% in one day:

Sensitivity of the ETNs to large changes in the market price of the underlying futures contracts

Because the Inverse ETNs and 2x Long ETNs are linked to the daily performance of the applicable underlying Index and include either inverse or leveraged exposure, changes in the market price of the underlying futures will have a greater likelihood of causing such ETNs to be worth zero than if such ETNs were not linked to the inverse or leveraged return of the applicable underlying Index. In particular, any significant increase in the market price of the underlying futures on any Index Business Day will result in a significant decrease in the Closing Indicative Value and Intraday Indicative Value of the Inverse ETNs, and any significant decrease in the market price of the underlying futures on any Index Business Day will result in a significant decrease in the Closing Indicative Value and Intraday Indicative Value of the 2x Long ETNs.

If the price of the underlying futures contracts increases by more than 80% in a day, it is extremely likely that the Inverse ETNs will depreciate to an Intraday Indicative Value or Closing Indicative Value equal to or less than 20% of the prior day's Closing Indicative Value and will be subject to acceleration if we choose to exercise our right to effect an Event Acceleration of the ETNs. If the price of the underlying futures contracts decreases by more than 40% in a day, it is extremely likely that the 2x Long ETNs will depreciate to an Intraday Indicative Value or Closing Indicative Value equal to or less than 20% of the prior day's Closing Indicative Value and will be subject to acceleration. If the price of the underlying futures contracts decreases by more than 80% in a day, it is extremely likely that the Long ETNs will depreciate to an Intraday Indicative Value or Closing Indicative Value equal to or less than 20% of the prior day's Closing Indicative Value and will be subject to acceleration if we choose to exercise our right to effect an Event Acceleration of the ETNs.

It's important to notice the the damage to XIV is done regardless of if Credit Suisse decides to terminate the ETN or not (they did decide to terminate it). By the 4:15pm mark of the VIX futures on Monday, the March futures were up roughly 85% (15 to 28? let's just use rough numbers), and the Feb futures were up roughly 100%. Since the XIV tracks the inverse of the weighted average of these contracts, what do you think happened to the value of XIV? Well, the closing NAV was $4.22 per share – needless to say, a massacre, but a massacre that the product was designed to execute. Note that this NAV destruction wasn't a result of any decision by Credit Suisse to accelerate termination of the ETN.

So you can see, if you understand how the product works, that the price action wasn't a result of "margin calls" or "contango" or "Credit Suisse sustaining massive losses on a long XIV position" (that's an especially nonsensical explanation being proffered by those who don't understand the mechanics and who have taken screenshots of 9/30/17 dated filings of XIV ownership which almost certainly illustrate prime brokerage or swap positions for CS, not naked exposure.) Here's a post that's gotten a lot of views that offers a series of incorrect explanations of the mechanics of this particular Volpocalypse. If you understand the mechanics of the $XIV ETN, you understand why most of the elements of that explanation are incorrect.

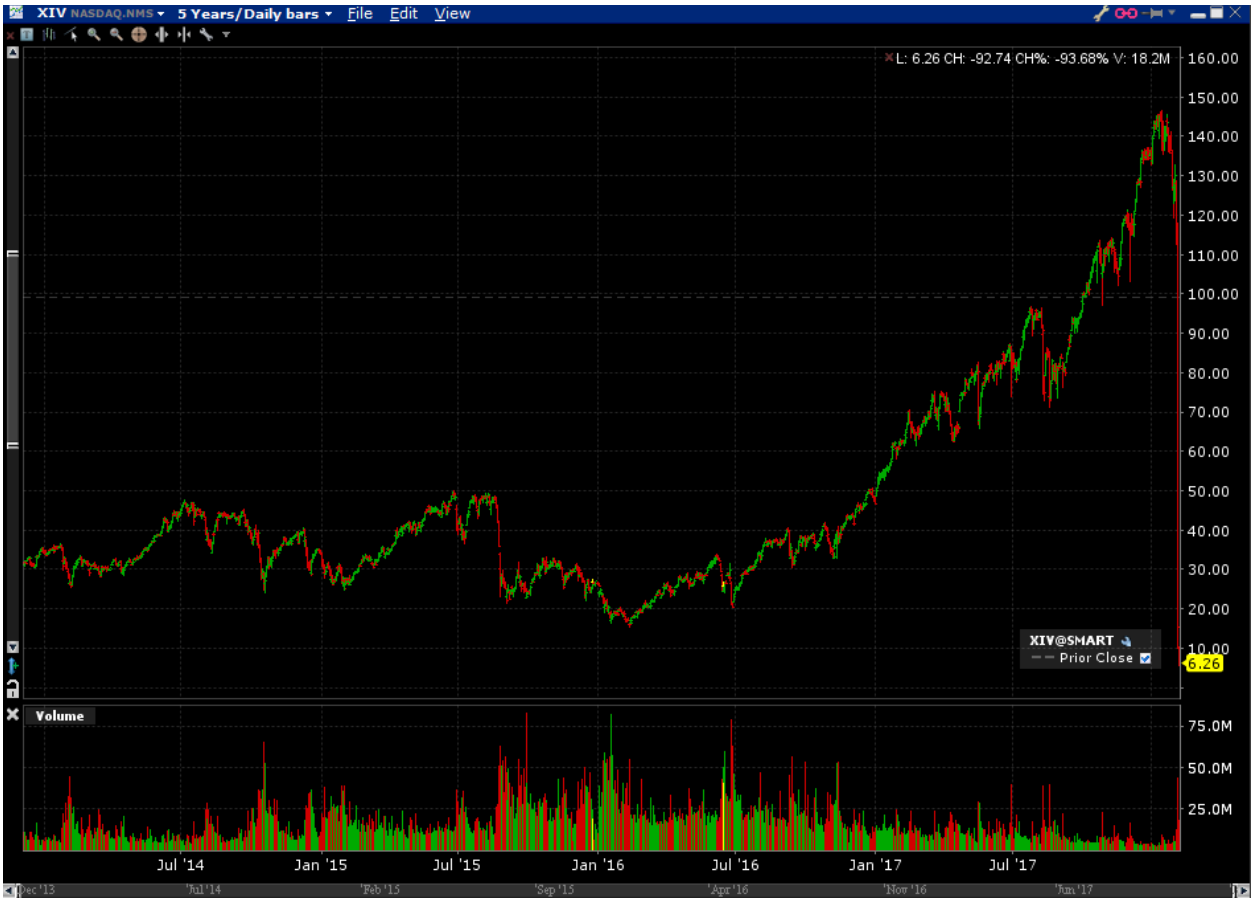
By the end of the day Monday, XIV's NAV was $4.22 per share, and it's market cap was roughly $ 60MM. The damage was done. Credit Suisse's eventual decision to terminate the fund, per the terms of the prospectus, isn't what causes damage – there's hardly any damage left – only $ 60MM notional! The damage was caused by the negative convexity of the rebalance in thin markets, which cascaded the NAV losses for the ETN.

When we look at the XIV chart, I have a few questions of my own:

I often say "markets are not efficient, but they're efficient enough." At 4pm on Monday, XIV was down slightly (let's call it on the order of magnitude of -10%), but nowhere near as much as the underlying short futures were up. It looks to me like it was trading at a pretty significant premium to NAV. Of course, after the 4:15 futures marks, XIV's decline accelerated, but it was still relatively orderly. We know that this ETN product is not one with a creation mechanism that any old arbitrageur can use – I think that only CS can "arb" NAV premiums by issuing more shares. Think, then about what would have happened if they'd done that: CS was in a position where they needed to buy a massive quantity of futures in order to rebalance the daily ETN exposure. The ETN was trading at a premium to NAV. If they'd been able to sell newly created shares, that "creation" would require them to sell VIX futures as a hedge, which could have offset their market-disrupting flows! Of course, that would probably raise all sorts of legal/ethical/moral issues, and would have seemed filthy to those on the other side of the trade.

Another point of random disinformation that needs correcting: no: XIV holders on the termination date will not receive Monday's $4.22 NAV. They'll receive the NAV on the termination valuation date.

This situation was indeed insane, and unprecedented, although many had noted the possibility for it to happen given the low-volatility powder-keg that had settled in and required little more than a match to ignite. The resulting 5 year chart is one you're unlikely to ever see again:



Ironically, while some were screaming that CS must have lost a ton of money as a result of this market dislocation (or as a result of assumed exposure that almost certainly doesn't exist), I'm inclined to believe that they made out like bandits in this event: They bought VIX futures all the way up and the ETN got the mark at the high of the day…. Sounds like a jackpot for the issuer…. This brings up another question: why did CS decide to terminate the ETN? Wouldn't they want to keep the product open (it opened for trading at a premium to NAV), arbitrage out the NAV premium (which results in issuing more shares and growing the assets of the fund), and try to continue to profit from their own rebalance-created flows? Or, in this post GFC world, were they concerned that this is a no-win situation with them, and they don't want the legal headache that's sure to come, regardless of the risk disclosures in the prospectus? That's a question I don't have the answer to.

EDIT 10pm 2/7/18: I spoke with a few savvy folks tonight who highlighted a few important points that I over-simplified in my post: 1) CS is the ETN issuer, but they may have laid off their risk exposure (ie: via swaps) to other counterparties. In any case, someone has exposure that's being hedged here. Every time above where I write above about CS hedging, it may not actually be CS… But the point was that maybe it wasn't CS who made money as I speculated in my final paragraph, and if CS did lay off the exposure, it could explain why they don't care about keeping this headache going. Why

would they lay off the exposure? Another good question. Risk metric limits on their balance sheet perhaps? I dunno… 2) There are a number of other volatility-related exchange traded products that had similar directional flows – this event wasn't just XIV's "fault" – I hope I didn't imply that. 3) the end of day VIX futures hedging is frequently done via TAS – trading at settlement – but the TAS collars were exceeded on Monday, resulting in overflow of trading into the live futures market. Normally, end of day flows are largely paired off via TAS trades in a liquid 2 sided market, which are the futures equivalent of a Market on Close order for equities, only they're locked in once executed (even though the traders don't know the exact price yet).

EDIT2 10am 2/8/18 I wanted to make a simplified spreadsheet to illustrate the effect that rebalancing other similar funds has. I went through the rebalance mechanics for XIV above, but it's important to note that **both the inverse ETNs and the double long ETNs will have rebalance flows in the same direction**, even though they offer performance in opposite directions! This is an underappreciated and coutnerintuitive quirk for many observers… Check out the spreadsheet (the far right "Rebalance Trade Required" column is the relevant one for these illustrative purposes), where the starting NAV is PURELY HYPOTHETICAL:

Ticker	Description	Hypothetical Day 1 NAV	Required Day 1 exposure	Underlying Index Move	Change in Value	New NAV	End of Day Exposure Value	New Required Exposure	Rebalance Trade Required
XIV	Inverse	$ 1,000,000,000	$ (1,000,000,000)	40%	$ (400,000,000)	$ 600,000,000	$ (1,400,000,000)	$ (600,000,000)	$ 800,000,000
SVXY	Inverse	$ 1,000,000,000	$ (1,000,000,000)	40%	$ (400,000,000)	$ 600,000,000	$ (1,400,000,000)	$ (600,000,000)	$ 800,000,000
UVXY	Double Long	$ 1,000,000,000	$ 2,000,000,000	40%	$ 800,000,000	$ 1,800,000,000	$ 2,800,000,000	$ 3,600,000,000	$ 800,000,000
TVIX	Double Long	$ 1,000,000,000	$ 2,000,000,000	40%	$ 800,000,000	$ 1,800,000,000	$ 2,800,000,000	$ 3,600,000,000	$ 800,000,000

Lots of past posts I've written about ETFs