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In this spirit, since I'm on the train for a minute, short thread on VIX and VIX futures/options, since this is something I see a ton of confusion about.

VIX is an index that measures the market implied level of 1-month variance on the S&P 500, or the square root thereof (to put it back in units we are used to).

This is not the same as volatility. A variance swap's payoff is proportional to volatility squared. If you are short a variance swap at 10%, and then realized volatility turns out to be 40%, you lose your notional vega exposure times 16 ( $= 40^2 / 10^2$ ).

To compensate for this, an equity index variance swap level is usually 2-3 points above the corresponding at the money implied volatility. So don't look at VIX versus realized vol and make statements about risk premium without recognizing this extreme tail risk.

The VIX is not a tradable index or total return index. You can buy all the options that go into the calculation of the VIX (look up the classic Derman paper if interested), but then you will start experiencing PnL from option decay and realized moves in the underlying.

And the next day you won't have the right basket of options anymore and will have to rebalance them etc. The VIX just tells you the price of the current basket of options, not about the profitability of owning that basket.

Now, VIX futures give you linear exposure to the level of the VIX at some point in the future. If you buy the 6-month futures at 17, and VIX settles at 18 on expiration, you make one point (times the contract multiplier).

Some people confuse VIX futures with forward starting variance. They are very different. If you buy them at 17 and they go to 34, your PnL is 17. Forward variance has that squared term in the PnL. Vega exposure on a variance swap (PnL per 1 vol point) doubles when vol doubles.

VIX futures don't have a model-free replicating portfolio in S&P options, they are just sort of their own thing. Dealers and vol arb managers have models for assessing their relative value compared to the S&P volatility surface and trade the spread when they see it rich or cheap.

But they are hyper liquid and primarily used by market makers to hedge the delta of the VIX options, which are the primary end user product. Large asset managers use VIX options extensively for hedging and speculation.

VIX options cash settle against the special quotation of the VIX Index, but their underlying is really the VIX futures; each maturity of options is priced off of, and hedged with, the future of the same maturity.

The VIX futures term structure is normally in contango (upward sloping), which is its way of manifesting volatility risk premium. If you buy a vix future, it will act like a portfolio hedge (rising if markets fall), so you pay for that via rolldown on the futures curve.

The options inherit that rolldown, because the futures are their underlyings. A 6-month call option will be priced with respect to the 6-month future, which in a normal market environment is probably trading 3-4 points above VIX spot.

If your 6-month option shows as 20 delta on your screen, that delta is with respect to the 6 month future, not the VIX Index. So if VIX spikes from 15 to 25 and the six month future spikes from 18 to 20, your call will be up 0.40 (plus likely a bump from vol of vol).

Train ride was over before I got to VIX ETPs, so here's the quick story there. These are the most commonly used retail products on VIX. The most popular one, VXX, always owns the 1st and 2nd future with a weighted average maturity of 1 month ("constant maturity 1-month").

You get the defensiveness of VIX futures and pay the typical rolldown over time. Often you see people post long term charts of the split adjusted price of VXX; it's not really that interesting, long vol tends to lose money over time, just like a short stocks or credit position.

You should evaluate the performance over long periods of time of a constant amount of risk, or dollar notional, of VXX; not of a single share. The latter is pretty meaningless.

It's like having an insurance policy that starts out as a \$1mm policy, but has a \$100k max lifetime spend, and as you pay premium over time you shrink the policy proportionally so that you never exceed your max spend. After a while you have a \$1k policy, then a \$10 policy

And if your house burns down you'll only recover 10 bucks ... that would be a crazy way to run or evaluate an insurance policy

VXX still might be an overly expensive way to protect an equity portfolio a lot of the time, but the right way to evaluate that is to understand what it's cost of carry is and how that's related to the persistent slope of the term structure, not looking at a long term price graph

The inverse ETPs (like XIV) were the opposite of VXX, shorting a constant maturity 1 month VIX futures portfolio. While one share of VXX reduces its long volatility position as it bleeds, XIV perpetually increased its short volatility position as it went up in price...

And on a day where VIX futures go up, XIV's NAV would go down and it had to sell VIX futures to reduce risk. It's also a very leveraged thing relative to S&P, given how volatile VIX futures are in a large selloff. So that did not go very well once XIV became big.

By late 2017, its size was such large VIX spike would force XIV and the other inverse and leveraged ETFs to buy many times the average daily volume worth of VIX futures right before the futures close, to reduce their risk back to the correct levels relative to their NAV.

So that ended up inevitably with volmageddon on 2/5/18. The timing was uncertain but we who followed these markets closely had been saying for years that this kind of event was inevitable given the market microstructure.

directional positioning in ETPs is far less offside. So the risk of that kind of a technical VIX blowup is much lower in the meantime.