

## “Invisible Threads: Matrix Edition”



Old Hickory Lake, TN – visible light image (L) and infrared light image (R)



**Morpheus:** Do you believe in fate, Neo?

**Neo:** No.

**Morpheus:** Why not?

**Neo:** Because I don't like the idea that I'm not in control of my life.

**Morpheus:** I know *\*exactly\** what you mean. Let me tell you why you're here. You're here because you know something. What you know you can't explain, but you feel it. You've felt it your entire life, that there's something wrong with the world. You don't know what it is, but it's there, like a splinter in your mind, driving you mad.

**Cypher:** I know this steak doesn't exist. I know that when I put it in my mouth, the Matrix is telling my brain that it is juicy and delicious. After nine years, you know what I realize?

*[Takes a bite of steak]*

**Cypher:** Ignorance is bliss.



**Agent Smith:** Never send a human to do a machine's job.

A right-hand glove could be put on the left hand if it could be turned round in four-dimensional space.  
— **Ludwig Wittgenstein, "Tractatus Logico-Philosophicus" (1921)**

I remember that I'm invisible and walk softly so as not awake the sleeping ones. Sometimes it is best not to awaken them; there are few things in the world as dangerous as sleepwalkers.

— **Ralph Ellison, "Invisible Man" (1952)**

Tell people there's an invisible man in the sky who created the universe, and the vast majority will believe you. Tell them the paint is wet, and they have to touch it to be sure.

— **George Carlin (1937 – 2008)**

Invisible threads are the strongest ties.

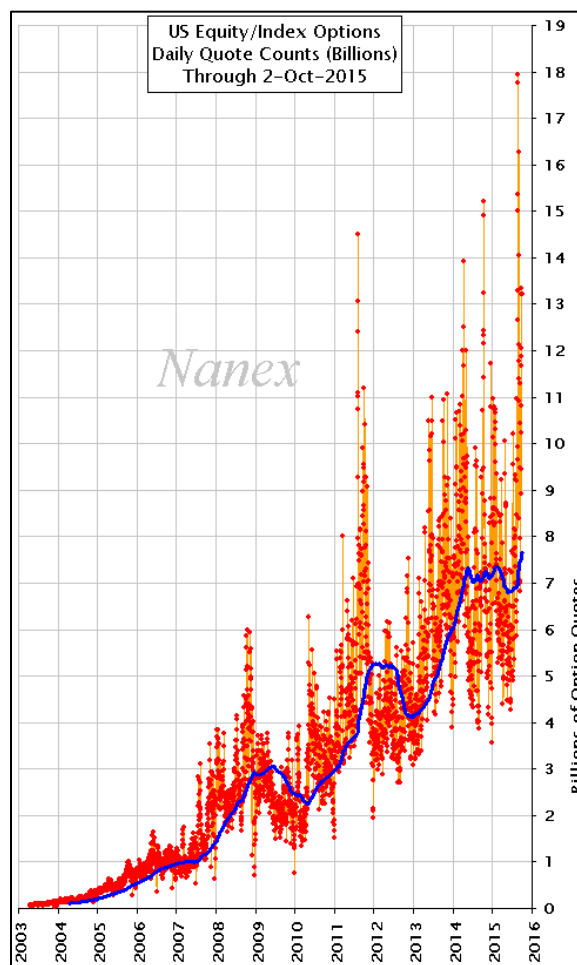
— **Friedrich Nietzsche (1844 – 1900)**

This is the concluding Epsilon Theory note of a trilogy on coping with the Golden Age of the Central Banker, where a policy-driven bull market has combined with a machine-driven market structure to play you false. The first installment – "[One MILLION Dollars](#)" – took a trader's perspective. The second – "[Rounders](#)" – was geared for investors. Today's note digs into the dynamics of the machine-driven market structure, which gets far less attention than Fed monetary policy but is no less important, to identify what I think is an unrecognized structural risk facing both traders and investors here in the Brave New World of modern markets.

To understand that risk, we have to wrestle with the investment strategies that few of us see but all of us feel ... strategies that traffic in the invisible threads of the market, like volatility and correlation and other derivative dimensions. A few weeks ago ("[Season of the Glitch](#)") I wrote that "If you don't already understand what, say, a gamma hedge is, then you have ZERO chance of successfully trading your portfolio in reaction to the daily 'news'." Actually, the problem is worse than that. Just as dark matter (which as the name implies can't be seen with visible light or any other electromagnetic radiation, but is perceived only through its gravitational effects) makes up some enormous portion of the universe, so do "dark strategies", invisible to the vast majority of investors, make up some enormous portion of modern markets. Perceiving these dark strategies isn't just a nice-to-have ability for short-term or tactical portfolio adjustments, it's a must-have perspective for understanding the basic structure of markets today. Regardless of what the Fed does or doesn't do, regardless of how, when, or if a "lift-off" in rates occurs, answering questions like "does active portfolio management work today?" or "is now a good time or a bad time for discretionary portfolio managers?" is impossible if you ignore derivative market dimensions and the vast sums of capital that flow along these dimensions.

How vast? No one knows for sure. Like dark matter in astrophysics, we “see” these dark strategies primarily through their gravitational pull on obviously visible securities like stocks and bonds and their more commonly visible dimensions like price and volume. But three massive structural shifts over the past decade – the concentration of investable capital within mega-allocators, the development of powerful machine intelligences, and the explosion in derivative trading activity – provide enough circumstantial evidence to convince me that well more than half of daily trading activity in global capital markets originates within derivative dimension strategies, and that a significant percentage (if you held a gun to my head I’d say 10%) of global capital allocated to public markets finds its way into these strategies.

Let me stick with that last structural change – the explosive growth in derivative trading activity – as it provides the best connection to a specific dark strategy that we can use as a “teachable moment” in how these invisible market dimensions exert such a powerful force over every portfolio, like it or not. The chart on the right, courtesy of Nanex’s Eric Scott Hunsader, shows the daily volume of US equity and index option quotes (not trades, but quotes) since mid-2003. The red dots are daily observations and the blue line is a moving average. In 2004 we would consistently see 100,000 options quotes posted on US exchanges on any given day. In 2015 we can see as many as 18 billion quotes in a single day. Now obviously this options activity isn’t being generated by humans. There aren’t millions of fundamental analysts saying, “Gee, I think there’s an interesting catalyst for company XYZ that might happen in the next 30 days. Think I’ll buy myself a Dec. call option and see what happens.” These are machine-generated quotes from machine-driven strategies, almost all of which see the world on the human-invisible wavelength of volatility rather than the human-visible wavelength of price.



There's one and only one reason why machine-driven options strategies have exploded in popularity over the past decade: they work. They satisfy the portfolio preference functions of mega-allocators with trillions of dollars in capital, and those allocators in turn pay lots of money to the quant managers and market makers who deliver the goods. But volatility, like love if you believe The Four Aces, is a many splendored thing. That is, there's no single *meaning* that humans ascribe to the concept of volatility, so not only is the direct relationship between volatility and price variable, but so is the function that describes that relationship. **The definition of gamma hasn't changed, but its meaning has.** And that's a threat, both to guys who have been trading options for 20 years and to guys who wouldn't know a straddle from a hole in the head.

Okay, Ben, you lost me. English, please?

The basic price relationship between a stock and its option is called delta. If the stock moves up in price by \$2.00 and the option moves up in price by \$1.00, then we say that the option has a delta of 0.5. All else being equal, the more in-the-money the option's strike price, the higher the delta, and vice versa for out-of-the-money options. But that delta measurement only exists for a single point in time. As soon as the underlying stock price change is translated into an option price change via delta, a new delta needs to be calculated for any subsequent underlying stock price change. That change in delta – the delta of delta, if you will – is defined as gamma.

One basic options trading strategy is to be long gamma in order to delta hedge a market neutral portfolio. Let's say you own 100 shares of the S&P 500 ETF, and let's assume that an at-the-money put has a delta of 0.5 (pretty common for at-the-money options). So you could buy two at-the-money put contracts (each contract controlling 100 shares) to balance out your 100 share long position. At this point you are neutral on your overall market price exposure; so if the S&P 500 goes up by \$1 your ETF is +\$100 in value, but your puts are -\$100, resulting in no profit and no loss. But the delta of your puts declined as your S&P ETF went up in price (the options are now slightly out-of-the-money), which means that you are no longer market neutral in your portfolio but are slightly long. To bring the portfolio back into a market neutral position you need to sell some of your ETF. Now let's say that the S&P goes down by \$2. You've rebalanced the portfolio to be market neutral, so you don't lose any money on this market decline, but now the delta of your puts has gone up, so you need to buy some S&P ETF to bring it back into market neutral condition. Here's the point: **as the market goes back and forth, oscillating around that starting point, you are constantly buying the ETF low and selling it high without taking on market risk, pocketing cash all the way along.**

There are a thousand variations on this basic delta hedging strategy, but what most of them have in common is that they eliminate the market risk that most of us live with on a daily basis in favor of isolating an invisible thread like gamma. It feels like free money while it works, which attracts a lot of smart guys (and even smarter machines) into the fray. And it can work for a long time, particularly so long as the majority of market participants and their capital are looking at the big hazy market rather than a thread that only you and your fellow cognoscenti can “see”.

But what we’re experiencing in these dark strategies today is the same structural evolution we saw in commodity market trading 20 or 30 years ago. In the beginning you have traders working their little delta hedging strategies and skinning dimes day after day. It’s a good life for the traders plucking their invisible thread, it’s their sole focus, and the peak rate of return from the strategy comes in this period. As more and larger participants get involved – first little hedge funds, then big multistrat hedge funds, then allocators directly – the preference function shifts from maximizing the rate of return in this solo pursuit and playing the Kelly criterion edge/odds game (read “Fortune’s Formula” by William Poundstone if you don’t know what this means) in favor of incorporating derivative dimension strategies as non-correlated return streams to achieve an overall portfolio target rate of return while hewing to a targeted volatility path. This is a VERY different animal than return growth rate maximization. To make matters even muddier, the natural masters of this turf – the bank prop desks – have been regulated out of existence.

It’s like poker in Las Vegas today versus poker in Las Vegas 20 years ago. The rules and the cards and the in-game behaviors haven’t changed a bit, but the players and the institutions are totally different, both in quantity and (more importantly) what they’re trying to get out of the game. Everyone involved in Las Vegas poker today – from the casinos to the pros to the whales to the dentist in town for a weekend convention – is playing a *larger game*. The casino is trying to maximize the overall resort take; the pro is trying to create a marketable brand; the whale is looking for a rush; the dentist is looking for a story to take home. There’s still real money to be won at every table every night, but the meaning of that money and that gameplay isn’t what it used to be back when it was eight off-duty blackjack dealers playing poker for blood night after night. And so it is with dark investment strategies. The *meaning* of gamma trading has changed over the past decade in exactly the same way that the *meaning* of Las Vegas poker has changed. And these things never go back to the way they were.

So why does this matter?

For traders managing these derivative strategies (and the multistrats and allocators who hire them), I think this structural evolution in market participant preference functions is a big part of why these strategies aren't working as well for you as you thought they would. It's not quite the same classic methodological problem as (over)fitting a model to a historical data set and then inevitably suffering disappointment when you take that model outside of the sample, but it's close. My intuition (and right now it's only intuition) is that the changing preference functions and, to a lesser extent, the larger sums at work are confounding the expectations you'd reasonably derive from an econometric analysis of historical data. Every econometric tool in the kit has at its foundation a bedrock assumption: hold preferences constant. Once you weaken that assumption, all of your confidence measures are shot.

For everyone, trader and investor and allocator alike, the explosive growth in both the number and purpose of dark strategy implementations creates the potential for highly crowded trades that most market participants will never see developing, and even those who are immersed in this sort of thing will often miss. The mini-Flash Crash of Monday, August 24<sup>th</sup> is a great example of this, as the prior Friday saw a record imbalance of put gamma exposure in the S&P 500 versus long gamma exposure. Why did this imbalance exist? I have no idea. It's not like there's a fundamental "reason" for creating exposure on one of these invisible threads that you're going to read about in Barron's. It's simply the aggregation of portfolio overlays by the biggest and best institutional investors in the world. But when that imbalance doesn't get worked off on Friday, and when you have more bad news over the weekend, and when the VIX doesn't price on Monday morning ... you get the earthquake we all felt 6 weeks ago. For about 15 minutes the invisible gamma thread was cut, and everyone who was long gamma did what you always do when you're suddenly adrift. You sell.

I can already hear the response of traditional investors: "Somebody should do something about those darn quants. Always breaking windows and making too much noise. Bunch of market hooligans, if you ask me. Fortunately I'm sitting here in my comfortable long-term perspective, and while the quants are annoying in the short-term they really don't impact me."



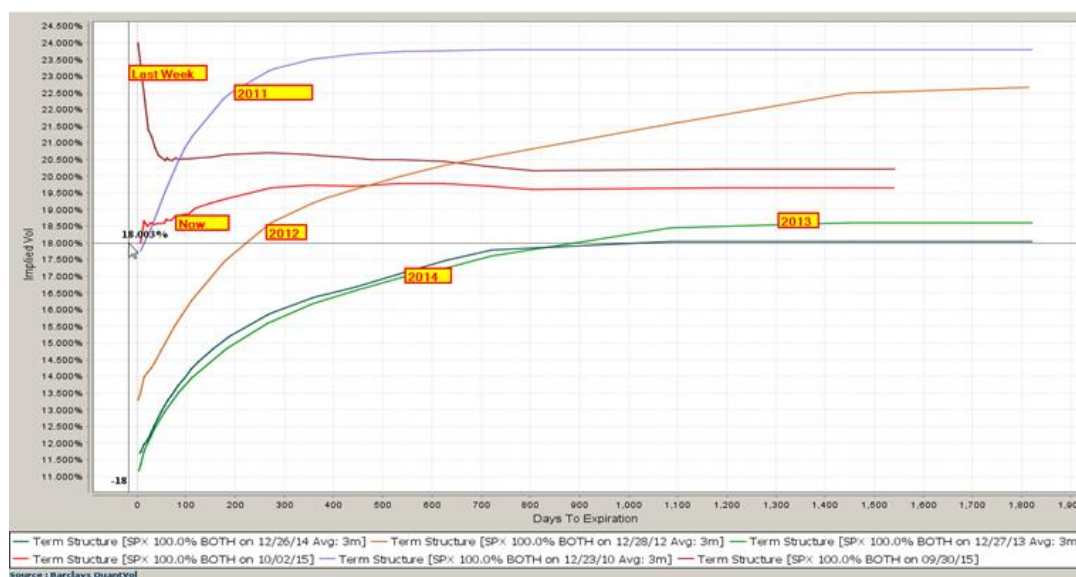
I think this sort of Statler and Waldorf attitude is a mistake for two reasons.

First, you can bet that whenever an earthquake like this happens, especially when it's triggered by two invisible tectonic plates like put gamma and call gamma and then cascades through arcane geologies



like options expiration dates and ETF pricing software, both the media and self-interested parties will begin a mad rush to find someone or something a tad bit more obvious to blame. This has to be presented in soundbite fashion, and there's no need for a rifle when a shotgun will make more noise and scatters over more potential villains. So you end up getting every investment process that uses a computer – from high frequency trading to risk parity allocations to derivative hedges – all lumped together in one big shotgun blast. Never mind that HFT shops, for which I have no love, kept their machines running and provided liquidity into this mess throughout (and enjoyed their most profitable day in years as a result). Never mind that risk parity allocation strategies are at the complete opposite end of the fast-trading spectrum than HFTs, [accounting for a few percent \(at most!\) of average daily trading in the afflicted securities](#). No, no ... you use computers and math, so you must be part of the problem. This may be entertaining to the Statler and Waldorf crowd and help the CNBC ratings, but it's the sort of easy prejudice and casual accusation that makes my skin crawl. It's like saying that "the bankers" caused the Great Recession or that "the [insert political party here]" are evil. Give me a break.

Second, there's absolutely a long-term impact on traditional buy-and-hold strategies from these dark strategies, because they largely determine the shape of the implied volatility curves for major indices, and those curves have never been more influential. Here's an example of what I'm talking about, courtesy of Barclay's Howard Alexander (who writes a killer occasional note on derivative trading), showing the term structure for S&P 500 volatility prior to the October jobs report ("Last Week"), the following Monday ("Now"), and prior years as marked.



Three observations:

- a) The inverted curve of S&P 500 volatility prior to the jobs report is a tremendous signal of a potential reversal, which is exactly what we got on Friday. I don't care what your investment time horizon is, that's valuable information. Solid gold.
- b) Today's volatility term structure indicates to me that mega-allocators are slightly less confident in the ability of the Powers That Be to hold things together in the long run than they were in October 2013 or 2014, but not dramatically less confident. **The faith in central banks to save the day seems largely undiminished, despite all the Fed dithering and despite the breaking of the China growth story.** What's dramatic is the flatness of the curve the Monday after the jobs report, which suggests a generic expectation of more short-term shocks. Of course, that also provides lots of room (and profits) to sell the front end of the volatility curve and drive the S&P 500 up, which is exactly what's happened over the past week. Why is this important for long-term investors? **Because if you were wondering if the market rally since the October jobs report indicated that anything had changed on a fundamental level, here's your answer. No.**
- c) In exactly the same way that no US Treasury investor or allocator makes any sort of decision without taking a look at the UST term structure, I don't think any major equity allocator is unaware of this SPX term structure. Yes, it's something of a self-fulfilling prophecy or a house of mirrors or a feedback loop (choose your own analogy), as it's these same mega-allocators that are establishing the volatility term structure in the first place, but that doesn't make its influence any less real. If you're considering any sort of adjustment to your traditional stock portfolio (and I don't care how long you say your long-term perspective is ... if you're invested in public markets you're always thinking about making a change), you should be looking at these volatility term structures, too. At the very least you should understand what these curves mean.

I suppose that's the big message in this note, that you're doing yourself a disservice if you don't have a basic working knowledge of what, say, a volatility surface *means*. I'm not saying that we all have to become volatility traders to survive in the market jungle today, any more than we all have to become game theorists to avoid being the sucker at the Fed's communication policy table. And if you want to remove yourself as much as possible from the machines, then find a niche in the public markets where dark strategies have little sway. Muni bonds, say, or MLPs. The machines will find you eventually, but



for now you're safe. But if you're a traditional investor whose sandbox includes big markets like the S&P 500, then you're only disadvantaging yourself by ignoring this stuff.

Ignorance is not bliss, and I say that with great empathy for Cypher's exhaustion after 9 years on the Matrix battlefield. After all, we've now endured more than 9 years on the ZIRP battlefield. Nor am I suggesting that anyone fight the Fed, much less fight the machine intelligences that dominate market structure and its invisible threads. Not only will you lose both fights, but neither is an adversary that deserves "fighting". At the same time, though, I also think it's crazy to ignore or blindly trust the Fed and the machine intelligences. The only way I know to maintain that independence of thought, to reject the Cypher that lives in all of us ... is to identify the invisible threads that enmesh us, some woven by machines and some by politicians, and start disentangling ourselves. That's what Epsilon Theory is all about, and I hope you find it useful.

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