SPECIAL ISSUE JULY 2012

EXPIRING MONTHLY

THE OPTION TRADERS JOURNAL

HIGHLIGHTS FROM Vol. 2

A SUMMATION OF ARTICLES FROM 2011–2012

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EXPIRING MONTHLY
THE OPTION TRADERS JOURNAL

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Bill is a private investor whose research and trading interests focus on volatility, market sentiment, technical analysis, and ETFs. His work has been has been quoted in the Wall Street Journal, Financial Times, Barron's and other publications. A contributor to Barron's and Minyanville, Bill also authors the VIX and More blog and an investment newsletter from just north of San Francisco. He has been trading options since 1998.

Prior to becoming a full-time investor, Bill was a business strategy consultant for two decades and advised clients across a broad range of industries on issues such as strategy formulation, strategy implementation, and metrics. When not trading or blogging, he can often be found running, hiking, and kayaking in Northern California.

Bill has a BA from Stanford University and an MBA from Carnegie-Mellon University.

Jared Woodard

Jared is the principal of Condor Options. With over a decade of experience trading options, equities, and futures, he publishes the Condor Options newsletter (iron condors) and associated blog.

Jared has been quoted in various media outlets including The Wall Street Journal, Bloomberg, Financial Times Alphaville, and The Chicago Sun-Times. He is also a contributor to TheStreet's Options Profits service.

In 2008, he was profiled as a top options mentor in Stocks, Futures, and Options Magazine. He is also an associate member of the National Futures Association and registered principal of Clinamen Financial Group LLC, a commodity trading advisor.

Jared has master's degrees from Fordham University and the University of Edinburgh.

Mark Sebastian

Mark is a professional option trader and option mentor. He graduated from Villanova University in 2001 with a degree in finance. He was hired into an option trader training program by Group 1 Trading. He spent two years in New York trading options on the American Stock Exchange before moving back to Chicago to trade SPX and DJX options For the next five years, he traded a variety of option products successfully, both on and off the CBOE floor.

In December 2008 he started working as a mentor at Sheridan Option Mentoring. Currently, Mark writes a daily blog on all things option trading at Option911.com and works part time as risk manager for a hedge fund. In March 2010 he became Director of Education for a new education firm OptionPit.com.

Andrew Giovinazzi

Andrew Giovinazzi started his career in the financial markets after graduating from the University of California, Santa Cruz with a B.A. in Economics in 1989. He joined Group One, Ltd. and quickly became a member of the Pacific Stock Exchange (and later the CBOE), where he traded both equity and index options over a 15 year span. During that period he never had a down year.

At the same time, Andrew started and ran the Designated Primary Market Marker post for GroupOne on the floor of the CBOE. It became one of the highest-grossing posts for the company in 1992 and 1993. While actively trading, Andrew was instrumental in creating and managing an option trader training program for Group One.

He left Group One, Ltd. to co-found Henry Capital Management in 2001. Andrew then joined Aqumin LLC (2008–2011) to help bring 3D quoting and analysis to financial data. He is Chief Options Strategist at Option Pit.

Editor's Notes

Mark Sebastian

We would like to welcome our readers to the annual "Best Of" Issue for 2012. In this you will some of the best works of Bill, Jared, Andrew and myself. You may also notice on the first page you are asked to take a survey. Bill, Jared and I are constantly trying to figure out ways to make a better product that is more captivating, interesting, and actionable.

I wish we were of the scale of a WSJ or US News; however, as there are only 3 main editors, when we work on one major project, in this case the overhaul of the magazine, it makes writing the magazine difficult. However, when we roll out the new research magazine, we think the product will be worth the wait. In other words, we will reward your patience with something great.

In the next few weeks prepare to see the new, overhauled Expiring Monthly, likely under a new name. While it will still keep the educational nature of Expiring Monthly, our plan is to make the new product more actionable and research based than the former incarnate, in the hopes that our readers (you) will not only learn when reading, but come up with some great trading ideas.

In the mean time, we hope you enjoy the best from the last year.

Good Trading,

Mark

reprinted from Dec 2011, vol. 2, no. 10

Gamma'd If You Do and Gamma'd If You Don't

Andrew Giovinazzi

What Is Gamma?

The Greek letter gamma evokes all kinds of ideas in my head. Mostly some of the worst short gamma days I had in my floor trading life. Walk home after the close and in the morning you have your face kindly ripped off from a gap up or down. Of course that is the first hint of what gamma is. It is the Greek that tells you how your position is behaving relative to a move in the underlying security. Are you getting longer or shorter the underlying (known as delta) based on a move in the security itself? Since I opened the can from my memories of a short gamma position we will talk about trading those below. How do you trade these things? Besides getting your face ripped off is there anything you can do in the meantime?

Where Is the Position Placed?

We will take our hypothetical short -100 gamma position and go about trading it. By -100 gamma that means for every $1 move in the underlying your position will collect 100 deltas in the direction *opposite of the movement.* **In short as the name rallies the position gets shorter and if the name declines the position gets longer.** You wonder what "placed" means? That is the idea of the surrounding factors that go into that -100 gamma position. Is the implied volatility relatively high or low? Is the implied volatility going in or out? Is the gamma coming from a small front month position or a larger back month position? Are you moving to the short strikes or the long strikes? These things matter because it might give you a clue as to how aggressive you need to be if things start to go awry. We will answer all these questions below.

What Is the Goal of the Position?

The goal of the position is to make money. That sounds glib but it is true of course. You make money on short gamma when the daily option decay outweighs any adverse underlying movements. That is a key construct. Kind of like getting paid for showing up. Also, you want the value of the options you sold to create the short -100 gamma position to decline. There has to be a setup for that kind of action to take place. If the realized volatility is still running around, you might want to hold off a bit. You can get more nuanced of course. Let's say you want to be short a name and want some short gamma as well because of favorable pricing. If the name is not going down to your liking you have the advantage of collecting decay. Or maybe you want to be short a name but have some short gamma at a target area. Even an adverse move can be covered by gamma that is *sold well.* Now we are talking about placement. Have your goal lined up first and that will start to dictate how you trade a short gamma position.

How Can You Trade It?

There are some things I look for first of all when I put on a short gamma position. First of all I try to take one side of the market out if I can help. By this I mean as an example, "this stock is a pig and at no time do I want to own deltas." In my mind I would always want to be synthetically at least small short deltas in the name somehow even if I was short a few puts. The biggest risk in a short gamma position is "the gap". Ultimately you have no control over that except that you have sold gamma well enough to cover the movement. If you have a gap in the direction of your bias you can reestablish the delta easy enough by adjusting with options or stock. Things are going in your favor. It gets dicier in a move in the opposite direction. At worst I would create a longer gamma position with the delta I want inside the short gamma position. That way if I was totally wrong my losses are stopped out.

When Do You Trade It?

Knowing when to adjust short gamma is tough and easy at the same time. By

adjusting I mean *getting back to more flat deltas or the desired deltas*. That also means buying into rallies and selling into drops. That is the tough part unless you have enough of a bias. For our example of -100 gamma the ideal would be to keep your deltas inside of you total short gamma -100. As soon as you move outside the band adjust half by reducing your delta exposure. This should keep you nimble and survive a few short gaps.

Gamma vs. Vega: Are You Fixing the Right Problem When You Adjust?

How to adjust is really the next question. Gamma for most purposes is a shorter term Greek but any option has a gamma component. The near term, at the money strike will always have the most gamma and quickly adjust the problem. The farther you go out you start to tip the balance between a gamma hedge and new vega exposure. Buying a big chunk of options 3 months out, while solving the gamma issue, brings in a whole host of issues with vega (volatility risk). All gamma is not created equal. It is usually best to hedge apples with apples when possible. If you need a whole bunch of deltas, using deep options over stock gives the advantage of a self-stopping position because of the embedded synthetic short option in any stock trade. For the deeper option the gamma does not show up until you move to the strike which will do little good from a gamma point of view. How the strikes are placed will dictate how you adjust so just try to minimize the new problems and risks you might create in any adjustment.

Are you damned if you do and damned if you don't adjust your short gamma positions? The goal is to collect decay and survive the options collapse. By using how your position is structured and creating a plan and stick to it you can survive much more than you think with a whippy environment like we have been having. If you can keep the tail risk controlled too, you might just get to keep your face right where it was on the close the day before. EM

Stocks Don't Crash Upward: Returns from a Naked Call-Selling Strategy

Jared Woodard

I was talking to a friend recently about the hedge fund manager Victor Niederhoffer, who is perhaps best known for blowing out his funds in 1997 when he was naked short puts on S&P 500 futures amidst a major decline in the index. Niederhoffer later filed suit, alleging that floor traders in the S&P pits at the CME conspired to drive the market down to force him out of his positions. He is probably the best known option seller in the business, and is held up now by educators as an object lesson in the dangers of naked short positions.

Selling naked puts in size will forever have a bad reputation, and maybe deservedly so. Markets can crash down, and since at least October 1987, out of the money puts have been priced to reflect that fact. But as I was thinking about Niederhoffer, it struck me that I had never heard of an option seller who focused on naked calls.

A Thought Experiment

This is more of a thought experiment than anything else, so bear with me. We know that the skew reflected in OTM puts relative to ATM options exists because of the non-normal historical distribution of equity returns. The tail is fatter on the left side of the curve, which makes investors willing to pay higher prices for puts in IV terms. But not all of the volatility risk premium is attributable to jump risk—calls are often overpriced, too. Many of the papers I reviewed for *Options and the Volatility Risk Premium* noted the presence of excessively bid calls, and a 2010 paper from Constantinides et al. reaches the same conclusion. The abstract:

> American options on the S&P 500 index futures that violate the stochastic dominance bounds of Constantinides and Perrakis (2007) from 1983 to 2006 are identified as potentially profitable trades. Call bid prices more frequently violate their upper bound than put bid prices do, while violations of the lower bounds by ask prices are infrequent. In out of sample tests of stochastic dominance, the writing of options that violate the upper bound increases the expected utility of any risk averse investor holding the market and cash, net of transaction costs and bid ask spreads. The results are economically significant and robust.

What then, should we think about call-selling strategies? One intuitive point in their favor is that stocks don't tend to crash up. They can move higher at a rapid pace, to be sure, especially during volatile periods and after large declines. And the bigger worry that occurred to me was the presence of momentum-driven markets in which stocks march steadily higher. The quantitative easing operations conducted by the Federal Reserve in 2010 created just this sort of environment, so I backtested a call-selling strategy beginning to 2009 to see what the returns were like.

Naked Call-Selling Returns

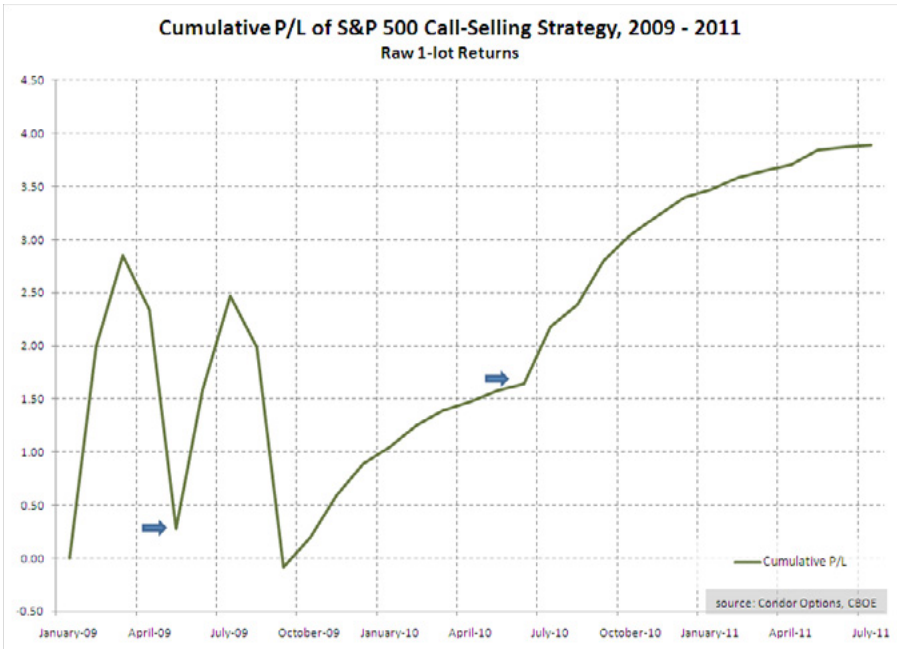
On expiration Friday, this strategy sells two-month S&P 500 index call options and holds them until expiration. The calls selected are those struck closest to the underlying price with moneyness greater than or equal to 1.10. For example, with the S&P 500 trading at 1170, we would sell the first two-month call with a strike equal to or greater than 1287. Calls are sold at the bid plus one tick.

Figure 1 shows the "raw" cumulative returns for the strategy on a 1-lot basis, i.e. if we sell one call each month and take the sum of the returns in the series. The strategy does exceptionally well under normal market conditions, even in the presence of strong upside momentum. Setting the moneyness parameter at 1.10 was apparently sufficient to avoid

drawdowns from rising markets during the QE2-dominated period, and obviously the tumult of August and September 2011 had no adverse effects. I have marked the May 2010 "flash crash" and the 2009 market lows with arrows to call attention to the fact that after periods of high volatility, inflated call premiums contribute excess returns subject to favorable price action. In plain English, high implied volatility makes any option selling more attractive, and as long as the market doesn't rise too quickly, the strategy does particularly well.

The strategy suffered only four losing months during this period, and two of them were small enough to have been recovered completely one month later. The two sizable losses came in the March–May 2009 period and the July–September 2009 period. The first loss is obviously attributable to the rapid rise in the index off of the March lows. Likewise, the index gained more than 20% from July to September expiration.

But a more thorough implementation of the strategy would not rely so heavily on changes in implied volatility to generate profits. In Figure 3, we are varying the number of contracts sold each month to bring in a constant credit of $5000



Condor Options, CBOE

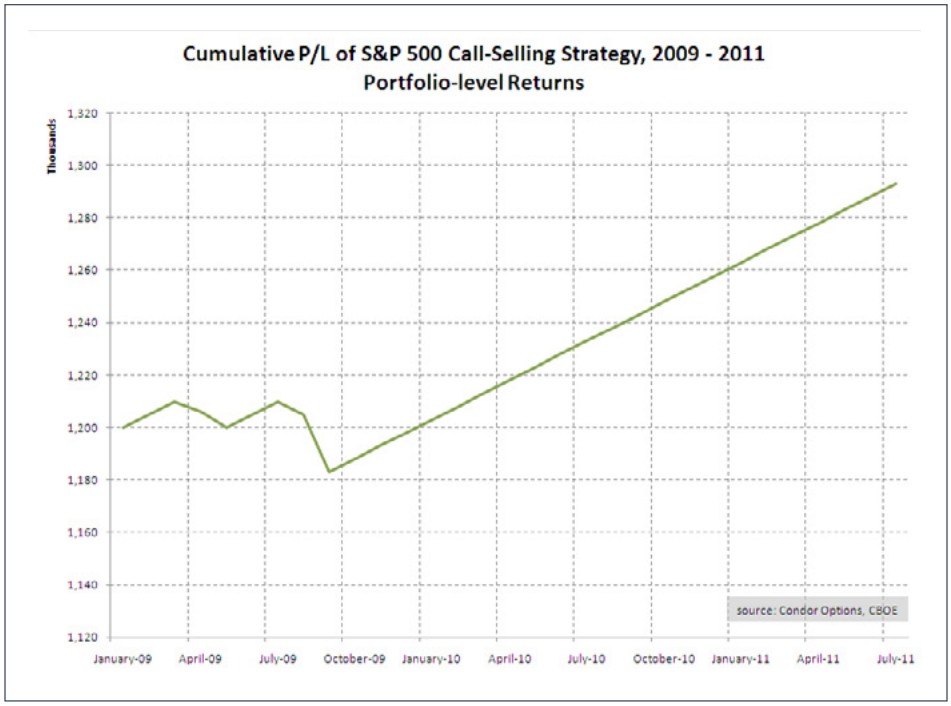
FIGURE 1 *Cumulative P/L of S&P 500 Call-Selling Strategy, 2009–2011, 1-Lot Returns*

thinkorswim

FIGURE 2 *S&P 500 prices, 2008–2011*

for each sale. I have sized the cash portfolio to reflect maximum Reg-T margin requirements. As you can see, this implementation significantly dampens the effects of early return volatility. The net return of about 7% over the period is obviously lower than the 30% S&P return, but with a 2% maximum drawdown, it offers a much better Sharpe ratio (0.462) than the market index (0.155).

As I said, this is a thought experiment, rather than a pre-packaged strategy, but the case for call-selling is stronger than I had anticipated. The application of some volatility and trend filters along with margin management techniques should further improve the returns shown here. EM



Condor Options, CBOE

FIGURE 3 *Cumulative P/L of S&P 500 Call-Selling Strategy, 2009–2011, Portfolio-level Returns*

History of the VIX

Mark Sebastian

OPTION TRADERS HOLD the idea of mean reversion in option volatility close to their hearts. Without reversion, I do not think it would be possible to trade price options in an efficient manner. It would be like insurance companies trying to price auto insurance with no long-term statistics on drivers.

In the case of the VIX, the long term mean is about 20%. However, that doesn't mean that it is constantly going to hover at 20 with strong pops below 20 and strong pops above 20. Let's not forget that the VIX has an unlimited upside. For instance, in 1987, if the VXO (the original VIX based on the OEX) existed the VIX would have traded close to 180% and taken more than two weeks to break 60. (Figure 1)

FIGURE 1

Vix and More

However, on the downside, below 20 the VIX does not have nearly as much room to run, the market is never going to truly stop moving so it will always have some sort of volatile; thus, we can consider the VIX's low band at somewhere around 9%. The result of this is that the VIX has many more low ticks below 20 than it does ticks above 20. However, because spikes up can be so high, it pulls the average price of the VIX up toward that 20% level.

Think of it this way, if we had 10 people in the room all in 7th grade, but one of them is the teacher who is about to retire, the average age of the group is about to happen.

Now that the VIX is below 15, I have been a little bit surprised by how many investment professionals have such a short term memory about market volatility and a lack of understanding of how the VIX works. In fact, if one were to really take some time to look at specific periods of time in the market over the last 20 years one would notice that there are times where traders would have considered a 15 VIX the sale of the year, and times where traders would consider a 15 VIX a great buy. Let's examine the last 20 years and see if we can find a few patterns.

Looking at the year 1992, the Iraq War ends, the US rises out of a post-war recession, and the market has an extended rally. This rally was pure tech bubble, it was slow and grinding. Looking at the VIX, many traders are surprised to see periods of time where the VIX is this low. (Figure 2)

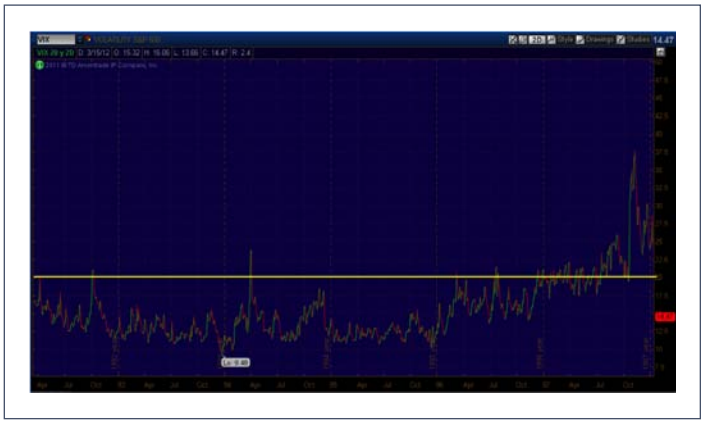


FIGURE 2

In about 5 years from just after 1992 began until 1997, the VIX broke 20 on five occasions and if traders had sold a 15 VIX they were almost certainly excited. A trader in 1994 would have thought that it would be crazy for the VIX to break 30 and would have considered 15 a huge sale.

In the beginning of 1997, the VIX finally starts to begin to get some movement and gets its first true surge because of our friends over at LTCM. Interestingly, this leads us into our first true period of increasing volatility, the tech bubble.

The period of 1998–2003 was marked by constant volatility; first the tech bubble hit, and in what is a rarity stocks

went up and so did volatility. Markets were starting to calm down and then September 11th happened. As the market was figuring out September 11th and the economic issues that came with it, we saw Enron blow up. (Figure 3)

It wasn't until early 2003 that the market finally worked through all of these crazy, volatile events. Each one of these events seemed to lead into another event and so on. In mid-2002 as Enron was melting and internet company after internet company was collapsing, it could have been hard for a trader to imagine that this would end. During that time, not only was a 15 VIX a buy, even 20 was a buy.

As the fear around Enron, the dot-com bubble, and terrorism started to subside, we entered a new period of low volatility and rallying markets. From early '03 until mid '07 again we enter another really slow period. (Figure 4)

It takes oil breaking 120, the Chinese economy slowing, and a rogue trader to finally get the market to blow up again. Until that happened, again we hit a period of time where traders thought a 15 VIX was a big sale, let alone 20. I remember when the VIX broke 10, we were all somewhat surprised—but more lamenting how slow the market was.

As you can see, at the end of '07 as oil is exploding and the housing market is starting to fall apart, we finally see the period of time that is currently in everyone's mind. The US banking crisis and the European Sovereign debt crisis. (Figure 5)

This is another period where traders think that it is impossible for the VIX to be below 20, crisis after crisis seems to keep hitting the economy, and the world. However, this is not going to last forever.

Looking back, each of these cycles is about 4–5 years long, we are about 4 ½ years into this crisis, the US economy is finally getting back on its feet. Banks are passing stress tests (mostly); our friends across the pond seem to have their house in order.

Could it be that we are heading into a new period? The market has been moving at a snail's pace this year. The actual 'realized' volatility of the market over the last 3 months has been less than 12%. A VIX of 15 is more than a 3% premium to market movement. Maybe VIX isn't low right now. If we consider the VIX a forward-looking index, maybe expectations of what volatility will be going forward are low, and the general public needs to catch up to the major investment houses and firms. EM

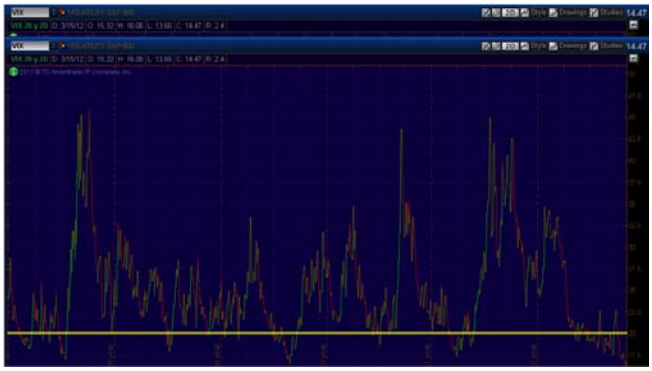


FIGURE 3

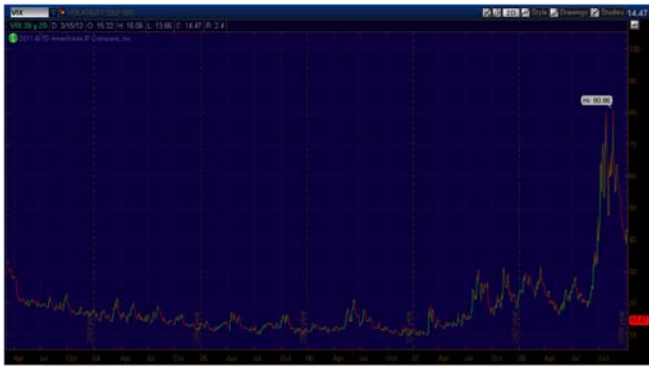
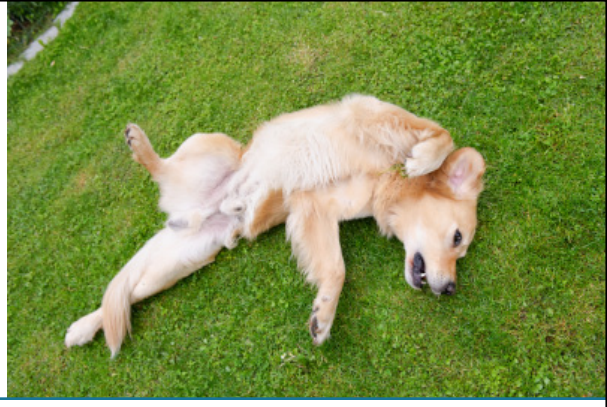


FIGURE 4

FIGURE 5



A History of VIX Futures
Roll Yields

Bill Luby

In the 7½ years since the CBOE launched VIX futures, stocks have experienced several prolonged bull markets and two very serious financial crises that were accompanied by sharp declines in stock prices and a surge in volatility. Across this full range of investment climates, the VIX futures have chronicled the expectations investors have had for future volatility, generally looking ahead seven months or longer.

The purpose of this article is to summarize the history of the VIX futures term structure in the context of roll yields in the front two VIX futures as well as between the fourth and seventh month VIX futures. These two periods have been chosen because they reflect the roll yields for VIX short-term futures exchange-traded products (ETPs) which target a constant maturity of 30 days, as well as VIX mid-term futures exchange-traded products (ETPs) which target a constant maturity of 5 months. The former VIX futures ETPs, which include the popular iPath S&P 500 VIX Short-Term Futures ETN (VXX), achieve the constant maturity of 30 days by selling some front month VIX futures each day and using the proceeds to buy second month VIX futures. In a similar fashion, the ETPs that target a constant maturity of 5 months, including the iPath S&P 500 VIX Mid-Term Futures ETN (VXZ), do so by selling 4th month VIX futures as part of a daily rebalancing process and buying the 7th month VIX futures.

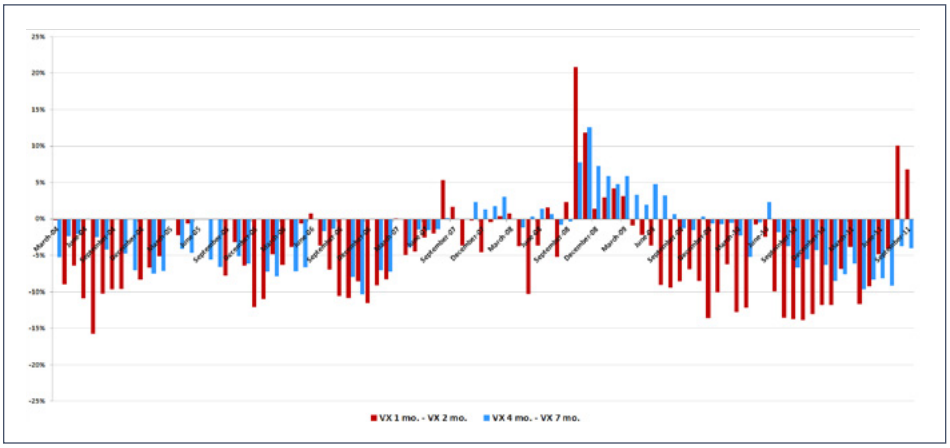
Comparative Roll Yield Data

Throughout their 7½ year life, the front month VIX futures have had a daily closing price that is lower than the second month VIX futures approximately 79% of the time. Over the course of a month, the second month futures are, on average, priced at about a 5% premium to the front month VIX futures.

Of course, these are just averages. There have been instances where the front month VIX futures have been priced at almost a 50% premium to the second month VIX futures, as was the case in October 2008. By the same token, back in July 2004 the second month VIX futures were more than 30% higher than the front month VIX futures for a brief period of time.

Compared to the differential between the front two months, the difference between the fourth and seventh month VIX futures has been less frequent and much less pronounced. During the same 7½ years the fourth month futures closed below the seventh month futures about 65% of the time and on average, the differential has been about 1.8%. In terms of extremes, the maximum differential between the fourth month and seventh month VIX futures appears to top out at about 15%.

Figure 1 below summarizes the average VIX futures monthly roll yields for both the front month and second month roll (red) as well



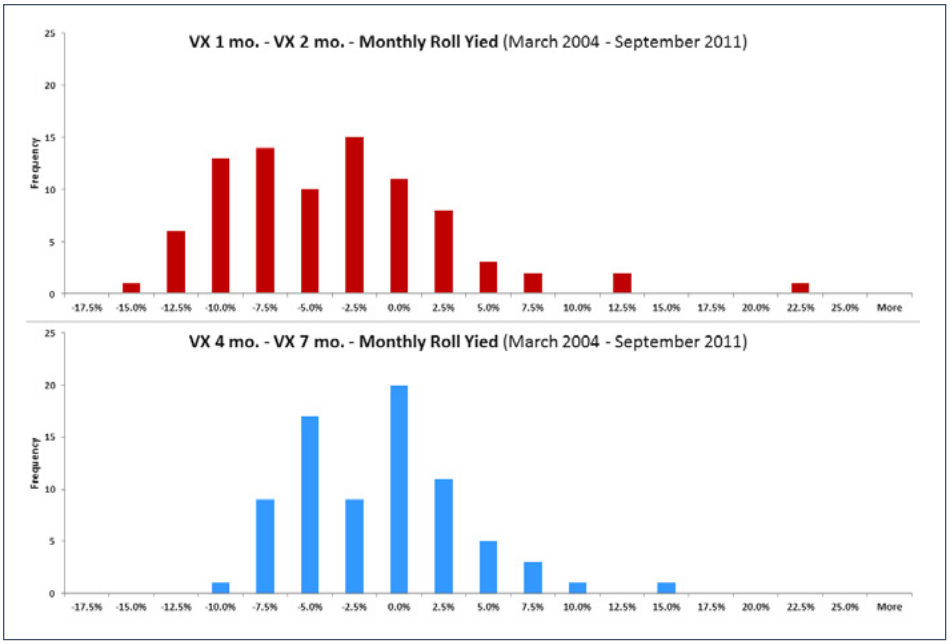
CBOE Futures Exchange, VIX and More

FIGURE 1 *Average VIX Futures Monthly Roll Yields, by Month*

as the fourth month and seventh month roll (blue) going back to 2004. Note that when one converts the daily data to monthly data, the aggregation of data accentuates the extremes. For instance, the front two months of VIX futures have negative roll yields in more than 81% of the months, while months four and seven experience negative roll yields on a monthly basis in more than 72% of the months. In fact, with the exception of the 2008 financial crisis and the last two months, there have been only a handful of instances where the monthly roll yield was positive for the full month.

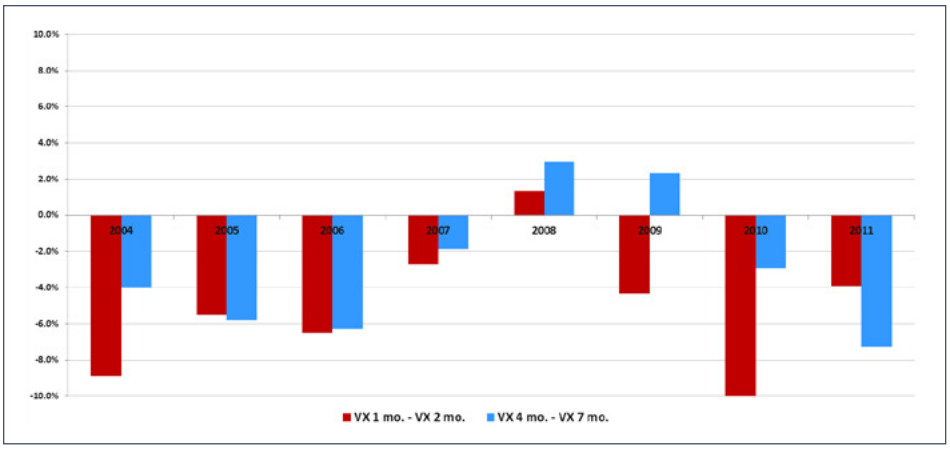
Figure 2 at right aggregates the monthly roll yield data into two histograms, with the front two months on top in red and the fourth-seventh roll on the bottom in blue. Note that the distribution of both of these roll yield data sets is skewed to the right or is positively skewed in statistical parlance. Another way of interpreting the data is to acknowledge that historically the large outliers have been in the context of high positive roll yield, which have happened to coincide with significant financial crises.

Figure 3 averages the monthly data over the course of each year since 2004. The variation in the yearly data and the contrast between



CBOE Futures Exchange, VIX and More

FIGURE 2 *Histograms of VIX Futures Monthly Roll Yield Data*



CBOE Futures Exchange, VIX and More

FIGURE 3 *Average Monthly Roll Yield, by Year*

the roll yields in front two months versus the fourth and seventh month is largely a function of the frequency and duration of volatility spikes. It turns out that 2008 and 2009 are the two years with the highest mean annual VIX readings, a fact which is largely responsible for the positive roll yield across the VIX term structure in 2008 and the positive roll yield which persisted at the back end of the term structure in 2009.

By contrast, 2005 and 2006 saw some of the lowest mean annual VIX readings on record, which translated into a negative roll yield of about 6% per month for two years across the VIX futures term structure. Note also the similarities between 2004 and 2010, where there was a substantial negative roll yield in the front two months, but a much milder negative roll yield between the fourth month and the seventh month. The reason for this is that in both 2004 and 2010, the VIX was declining substantially from elevated levels in the previous year.

Conclusion

As noted above in *Trading the Expanding VIX Products Space*, when it comes to VIX-based exchange-traded products, the longer the holding period, the more the roll yield determines the long-term return. These products have an aggregate return which consists of changes in the price of VIX futures, plus or minus the impact of roll yield. In the long run, the VIX is mean-reverting and the changes in volatility approach zero, which means that long-run returns are almost entirely determined by roll yield.

The graphics and data above should provide investors in the VIX ETP space with some ammunition to help them structure strategies which can take advantage of historical tendencies in the VIX futures term structure and the implications it has on roll yields and returns. With options available on three of the VIX ETPs that target 30 days to maturity (VXX, VIIX and VIXY) as well as two of the VIX ETPs which target 5 months to maturity (VXZ and VIXM) considerable opportunities are available in this space to generate some impressive long-term returns. EM

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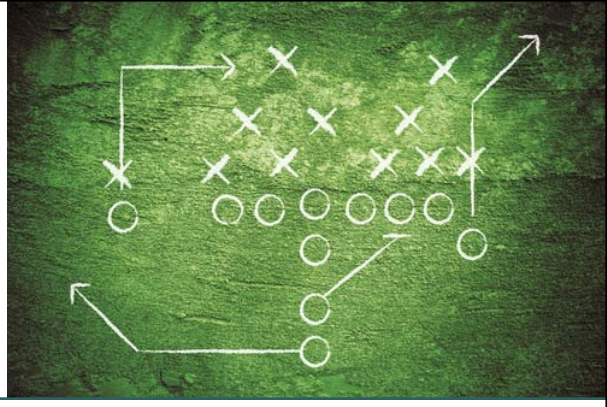

Tactical
VIX Hedging

Jared Woodard

IN THE LAST FEW YEARS, so many exchange-traded, volatility-linked products have launched that it takes a chart or table to keep track of them all. However, they are generally missing a component that is, in my view, essential for cost-effective hedging of a stock portfolio: rules for tactical allocation. "Tactical allocation" just refers to the practice of devoting capital to an asset only under certain conditions. If you have ever scaled into or out of a position based on a moving average or some other similar criterion, you are already familiar with tactical allocation. In the case of portfolio hedging, the idea is to devote capital to a hedging vehicle—in this case to volatility-linked products like VIX futures—in response to changing market conditions.

An investor relying on VIX or historical volatility alone to generate hedging signals would have been in excessively large hedge positions for the last few months of 2011.

For this month's Follow That Trade, I am looking in more detail at the allocation levels for the VIX Portfolio Hedging (VXH) strategy to illustrate this notion of VIX hedging using tactical rules. The baseline orientation is that we have a long equity portfolio we want to hedge and so we devote cash or margin worth 8–10% of the value of the portfolio to be used for hedging. VXH makes allocations to VIX futures contracts and/or VXX shares, and the real value of the strategy is its ability to vary exposure to those volatility products in response to market inputs.

Here are two qualities that an attractive hedging strategy should have. First, it should minimize drag, by which I mean the underperformance of a hedged portfolio versus an unhedged portfolio during bull markets. The majority of the time, we want our hedge position to be as small as possible, because hedging typically incurs costs. A smaller hedge position means a weaker drag on our performance during flat and rising stock markets. Second, because markets can turn south relatively quickly, however, another desirable feature is the ability to scale into larger hedge positions just as quickly. These qualities are in tension with one another: a strategy that increases the size of the hedge position too quickly will incur higher costs and treat every market hiccup as a looming crisis, while a strategy that reacts too slowly will achieve low drag but will also prove ineffective during genuine market downturns. The trick is obviously to find a suitable balance.

Figure 1 compares the reactivity of three estimates of broad market turmoil. The levels for VIX and for a one-month close-close estimate of S&P 500 historical volatility should be familiar to most readers (in light and dark green, respectively). The black line shows the allocation level for

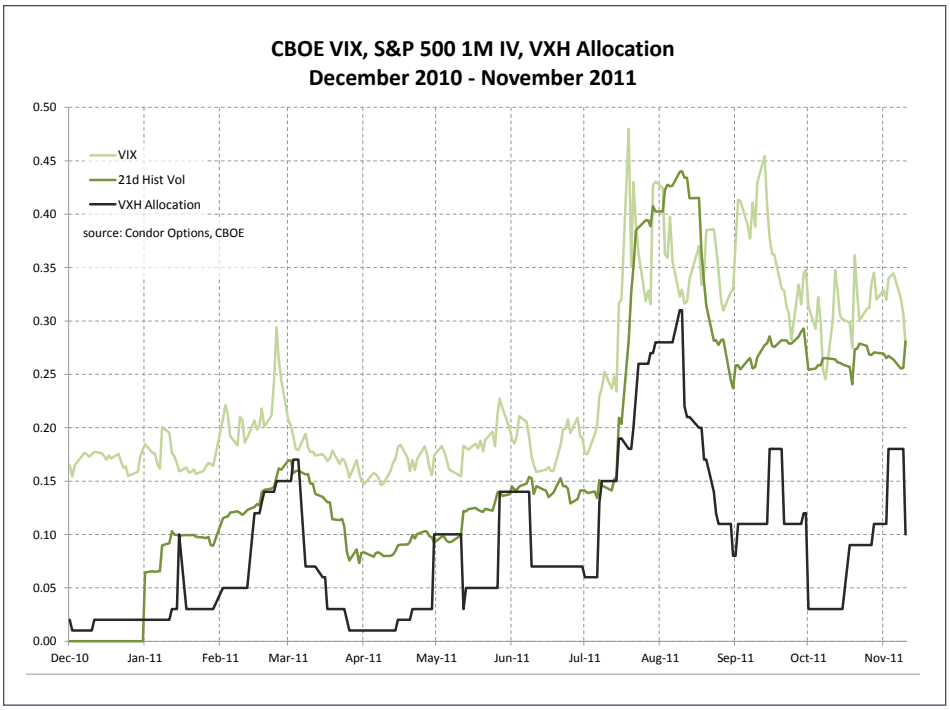

FIGURE 1 *CBOE VIX, S&P 500 1-month historical volatility, and VXH allocation levels, December 2010–November 2011*

the VXH strategy. The VXH allocation can technically fall anywhere between 1–100%, and as you can see it climbed above 30% in late August. I want to assess how well VXH met the two criteria explained above in relation to the VIX and HV estimates. First, regarding minimized drag, note the wide gap between VIX and VXH at various points, e.g. December 2010 and January 2011, April 2011, and September–November 2011. VXH always runs "cooler" than VIX, but the divergence is often substantial. The ability of VXH to climb down quickly from elevated levels in the last part of the year made all of the difference between preserving gains made earlier and giving them up as markets recovered. An investor relying on VIX or historical volatility alone to generate hedging signals would have been in excessively large hedge positions for the last few months of 2011; this illustrates, again, that quickly reducing hedge exposure is just as important as increasing it. With respect to the second goal, the tactical rule set behind VXH reacted quickly in March and in August to offset losses in the core equity portfolio.

One of the most important benefits of a tactically-allocated hedge strategy will not appear in any simple annual return comparison because, most of the time, market declines are not catastrophic and the world does not end. But those return comparisons will miss the fact that tactically hedged portfolios will achieve a lower volatility of returns. The volatility of returns

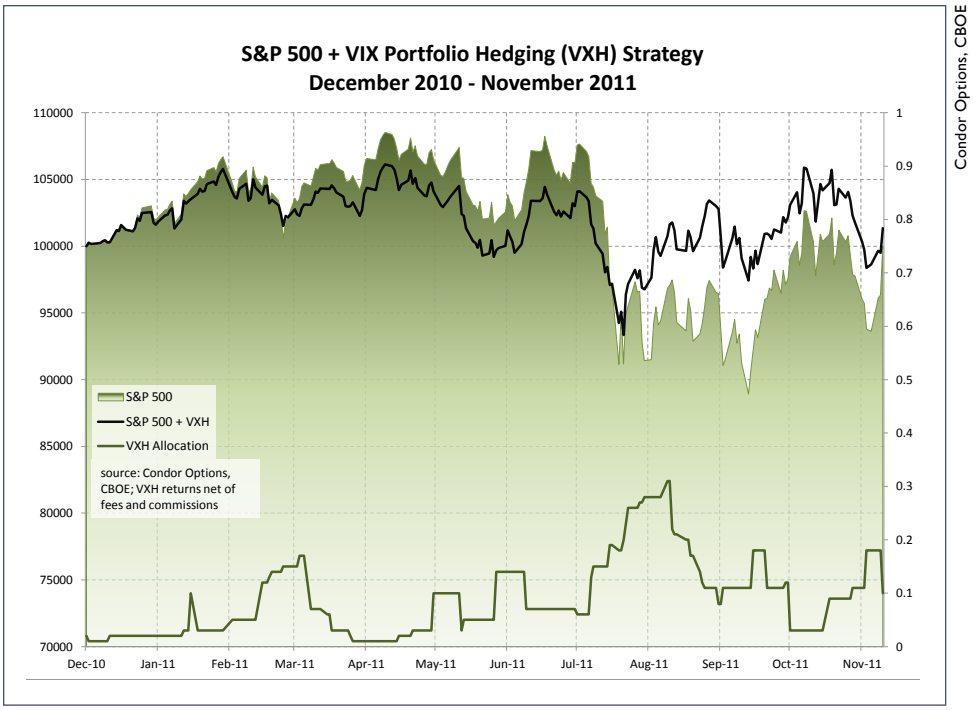

FIGURE 2 *S&P 500 and S&P 500 hedged with VXH, 2010–2011*

matters because it is the whipsaws from large nominal gains to crushing losses and then back again that make some investors want to leave the market altogether. While a tactically hedged portfolio might not reach the same heights as an unhedged peer, if those peaks are followed by sudden valleys, the value provided by a hedge becomes more evident.

Figure 2 compares the returns of an unhedged S&P 500 portfolio (green area) with those achieved by a tactical VXH allocation (black line). Again, by ramping up VIX futures exposure in mid- and late August, the hedged portfolio saw smaller drawdowns and a more stable equity curve. As the market stabilized, hedge exposure quickly fell to 11% and then even 3% by late October. Compare this style of allocation with the discretionary hedging advocated by the Roubinis of the world: even though the European sovereign debt crisis was as ugly as ever in September and October, because the market had stabilized in terms of price and several volatility relationships, a large hedge position was not indicated.

The criteria laid out here and the method of meeting them via responsive allocation levels can be used to inform any hedging strategy. The volatility-linked products available now and the low commission rates available for such products means that the time for conventional hedging strategies is long over. **EM**

reprinted from May 2012, vol. 3, no. 3

Are Bonds Telling the VIX Next Move?

Mark Sebastian

INSURANCE, EVERY trader wants it, but only a few products actually provide it. Insurance products don't exactly offer the best returns, but what they do offer is safety. Say what you will about the state of U.S. debt; regardless, the owner of a bond or note will receive the full value of the bond or note when the treasury expires. It is for this reason that, in times of panic, we see bonds rally to extreme levels. Another 'insurance product' is S&P volatility. When the market is exploding, be it puts on the physical SPX or options on VIX, the prices of these products skyrocket.

Because of this, there is generally a correlation of prices between the price of the 30-year future and the VIX, which keeps the spread between the two at a somewhat consistent level. Similarly, that relationship holds true in TLT. While the bond future is the preferred method for trading U.S. debt for institutional traders, we are going to study the relationship of TLT to VIX, because of the continuity of price that doesn't exactly exist between the futures. The basis of futures from contract to futures contract throws off pricing just enough that this doesn't graph as neatly. That said, I think it would behoove any serious trader to follow up the results of our study with a look at the relationship between the ZB futures contract and the VX futures contract. That would produce a potentially tradable approach to swapping ZB futures or options against VX futures or options.

Since TLT was first listed, the Bond ETF has had an all time low price of just over $81.00 a share and had a high price of just over $124.00 a share. The ETF pays a dividend based on the yield of its bonds rather than storing the returns; thus the price is almost exclusively based on where the current long term yields are priced. At the $124 price, long term yields are below 4. At its price of $81 in 2003, long term yields were MUCH greater. As we stated above, generally speaking, the price of this product moves up with fear and down with calm (at least since the Fed began using rates to try to fix the economy).

The VIX, or fear index, represents the cost of insuring a portfolio at any given time using SPX options. In times when the market is in turmoil, the VIX will typically be hitting its peak. Over the last 10 years, that time came during the 2008 financial crisis. The VIX touched a high of almost 80; it hit its low in times where many thought all was well. The index traded below 10 intraday in February 2007 before settling at a low just above 10.00.

On their own, the VIX and TLT each point toward what is happening in the marketplace at any given time. It would make sense that the spread between VIX and TLT is somewhat mean reverting. Upon an optical scan, I noticed that there was a direct relationship. A student of mine, Sam Harris, took my optical observation and sent me a 10-year chart of the price of TLT minus the price of VIX. The results produced a very clear pattern and distribution.

In Figure 1, we can clearly see that there has been a natural mean in the relationship of TLT to VIX at around 70–80. This makes sense, as when TLT

On their own, the VIX and TLT each point toward what is happening in the marketplace at any given time.

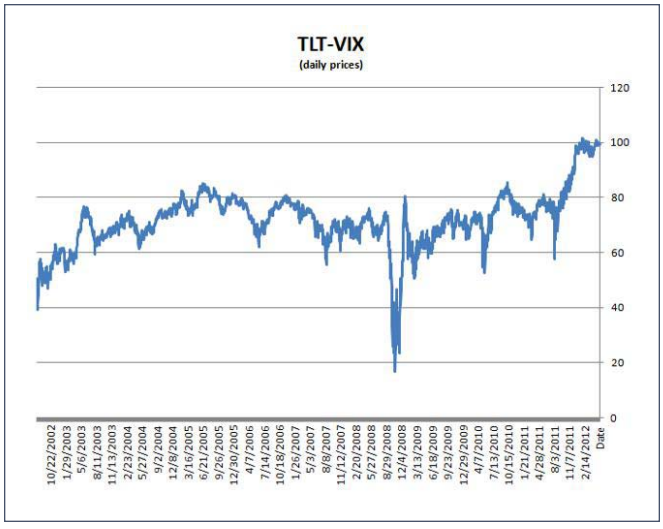

FIGURE 1 *TLT–VIX*

is at a low price, so is VIX, for instance in 2007. In Feb 2007, when the VIX hit its all time low, TLT was also trading near its all time low. This produced a price right around 70. Even in 2008, as the financial crisis unfolded, we do not see a major straying of the relationship of TLT to VIX. While the VIX exploded to over 50 and stayed there for some time, TLT traded into the low 120s, keeping the spread close to 70.

In fact, the relationship is almost always around 70 to 80. Sam put together another chart showing where the distribution of prices land.

In Figure 2, one can see that the overwhelming majority of the time, the price landed in between 70 and 80. Figure 3 shows a 3D version of Figure 2 with some dates.

Interestingly, usually when there was a panic, the spread between the two drops to near 60 before moving back into the 70s. We saw this when the 2008 crisis happened. We also saw the spread drop in the 2010 flash crash, and the spread also fell in August ahead of Greece.

More subtly though, if one studies the graph one might notice that, while initially on a VIX pop the spread drops in a crisis, leading into the VIX pop, there is a subtle increase in the spread. This is usually from the low 70s out to the upper 70s.

This is what makes what the market is currently experiencing so stunning and hard to trade. The current TLT is priced at complete panic levels, while VIX is only priced at

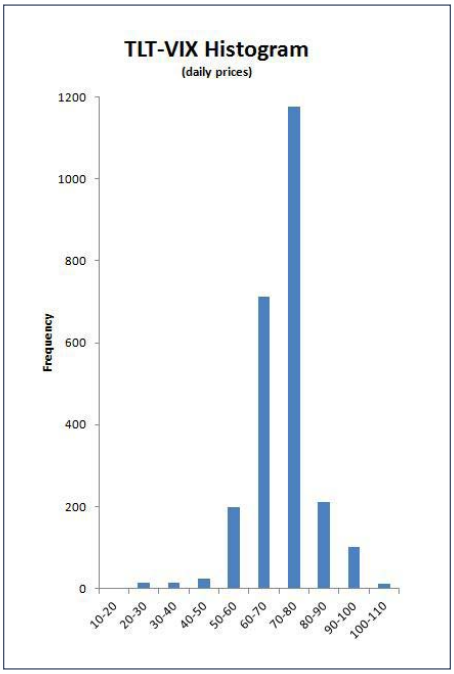

FIGURE 2 *TLT–VIX Histogram*

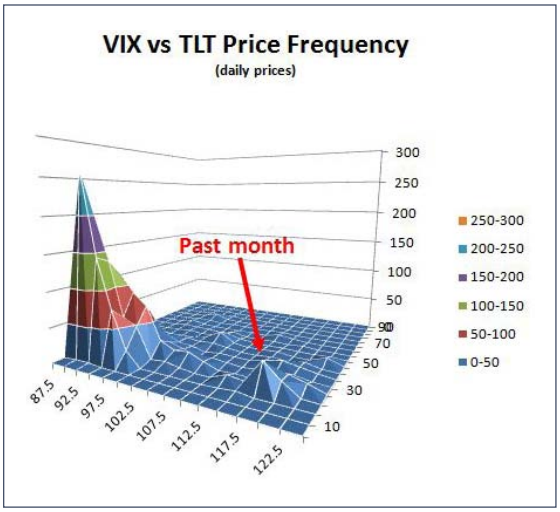

FIGURE 3 *VIX vs. TLT Price Frequency*

elevated levels. This is producing a pricing spread that is trading over 100 rights as I write this article. 100 is a level that was completely unheard of, a level that had never legitimately traded until the last few months of 2011 and into 2012. Essentially, while the VIX came off from its August of 2011 levels, bonds never eased very much. Even as the TLT hit its recent lows a few weeks ago, the spread was in the 90s. Things have gotten a little more dramatic over the last few weeks, while the VIX has rallied from 17-ish to touching 25; the rally in TLT has pushed the spread between VIX and TLT to all time highs.

Why?

While one might point to the culprit being operation twist, and I am certain that TWIST has not helped, I would point to another culprit out here: Fixed income still believes that there is a major event about to happen, even if the equity markets do not. Here is the scary part. If the spread is now over 100, what type of VIX spike is it going to take to bring this spread back to normal?

My thoughts: I have a hard time seeing rates go to 3%. I think there is an easy trade for the pickings right now, and I would/am selling call spreads on TLT, and at the same time, I am buying VIX call spreads. If one was so inclined, one could also consider selling TLT, buying VIX, and buying S&P futures. I would obviously dollar-weight it, but I would end up owning twice as much VIX. Basically, I would sell the expensive insurance and buy the cheap insurance. EM

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The VIX Term Structure as a Predictor of Future Returns

Bill Luby

THIS PAST MONTH has seen the largest sustained CBOE Volatility Index (VIX) futures contango in history and along with this phenomenon has come a host of questions about how significant the VIX futures term structure is in terms of predicting future stock market returns as well as predicting future volatility.

I touched on the subject of the predictive ability of the VIX futures term structure in October in *Investing Implications of the VIX Term Structure,* when I examined the future return patterns of equities, bonds, gold and VIX-based exchange-traded products in markets characterized by contango and backwardation of the VIX futures term structure. While this type of analysis may be helpful for characterizing the market for VIX futures in general terms, as the VIX futures are in contango 75–80% of the time, a degree of additional specificity could certainly better inform trading strategies that account for the shape of the VIX futures term structure as a key input into the strategy process.

Backwardation *A downward sloping futures term structure in which the front months are more expensive than the back months.*

Contango *An upward sloping futures term structure in which the front months are less expensive than the back months.*

As a result, this time around I have undertaken an analysis that is more granular and considers the degree of contango and backwardation in the VIX futures and attempts to determine the relationship between the slope of the VIX futures term structure and future returns in the S&P 500 index. Three questions in particular I hoped to find answers to:

1. Is extreme contango useful for predicting the future performance of the SPX or the VIX?
2. Is extreme backwardation useful for predicting the future performance of the SPX or the VIX?
3. Is there a linear relationship between the slope of the VIX futures term structure and the future returns of either the SPX or the VIX?

Analysis of VIX Futures Term Structure by Decile

VIX futures data are available going back to the March 2004 launch of the VIX futures. For the first two years VIX futures contracts were traded, the contract months were limited and somewhat haphazard. It was not until October 2006 that the CBOE revamped the VIX futures contracts, adding enough months to ensure that the first five consecutive months were always offered. Since May 2008, at least the first seven consecutive months have been available to trade.

In evaluating the VIX futures term structure data, I analyzed the full set of VIX futures settlement prices going back to 2004 as well as the more modern consecutive front five months data subset that originates in October 2006. In each case, I calculated the slope of the VIX futures term structure from all available VIX futures contracts for each day, then used the slope of the overall VIX futures term structure to create ten buckets of VIX futures data. For these deciles, I then calculated the mean returns for each decile for both the SPX and the VIX for seven separate periods ranging from 1 day to 100 days. As noted earlier, I performed the same analysis for the data from March 2004 and the continuous consecutive contract data from October 2006. As it turns out, there were only minor differences between the data from March 2004 and the data from October 2006, so I elected to focus on the full data set from March 2004.

An analysis of the decile data showed two promising developments. First, the top performing decile for the SPX for periods from 1–100 days was overwhelmingly the decile with the

The S&P 500 index is a consistent outperformer when the VIX futures term structure is in steep backwardation.

most extreme VIX futures contango. At the same time, the worst performing decile for the VIX for periods ranging from 1–100 days was overwhelmingly the decile with the most extreme VIX futures backwardation.

While it was interesting to see that the two VIX futures term structure extremes coincided with the best performing SPX data and the worst performing VIX data, what was just as interesting was that these happened at the opposite ends of the VIX futures term structure extremes. In fact, while extreme VIX futures backwardation seemed to be an excellent predictor of future VIX declines, it appeared to have very little predictive value in terms of future SPX performance. Similarly, while extreme contango seemed to be an excellent predictor of future SPX gains, it appeared to have only a weak predictive value in terms of future VIX performance.

Given the richness of the results for the SPX in steep contango and the VIX in extreme backwardation, the amount of noise in the balance of the quintile data was certainly disappointing.

Summarizing the Data by Quintile

Considering the possibility that the decile data might be too granular, I aggregated the results from the ten quintiles into five deciles in hope that the larger buckets (n=201 for the decile buckets, n=402 for the quintile buckets) might yield some more distinct patterns across the full set of quintiles.

Figure 1 summarizes the quintile data for future returns for the SPX using VIX futures data from March 2004 to the present, with quintile 1 (slope of 0.0302) aggregating the data for that 20% of the time when the VIX futures were in the steepest contango and quintile 5 reflecting the 20% of the time when the VIX futures backwardation was most pronounced.

With any luck, the color coding makes this table easier to read. Note, for instance, that the contango-heavy quintile 1 has either the highest aggregate gains (bright green shading) or second highest aggregate gains (olive green shading) for each period from 1–100 days into the future. As was the case with the decile analysis, however, the quintile summation data for extreme backwardation in quintile 5 shows that while extreme backwardation is associated with the highest gains on the next trading day, looking out 3–100 days reveals performance data that is for the most part right in the middle of the other deciles.

Converting the VIX performance data from deciles to quintiles also yields little in the way of additional insights. Figure 2 shows that extreme VIX futures backwardation (quintile 1) is an excellent predictor of future declines in the VIX. On the other hand, quin-

		Mean SPX Performance, N Days Later						
Quintile	**VX Slope**	**ROI +1**	**ROI +3**	**ROI +5**	**ROI +10**	**ROI +20**	**ROI +50**	**ROI +100**
5	(0.0202)	0.079%	0.083%	0.065%	-0.121%	0.150%	0.977%	1.766%
4	0.0025	-0.063%	-0.071%	-0.080%	0.035%	-0.260%	-0.768%	-1.436%
3	0.0090	-0.029%	-0.043%	0.003%	0.262%	0.546%	1.763%	2.633%
2	0.0159	0.059%	0.174%	0.209%	0.261%	0.619%	1.254%	2.010%
1	**0.0302**	**0.066%**	**0.186%**	**0.315%**	**0.589%**	**0.877%**	**1.272%**	**3.101%**

FIGURE 1 *Mean SPX Performance by VIX Futures Slope Quintile*

		Mean VIX Performance, N Days Later						
Quintile	**VX Slope**	**ROI +1**	**ROI +3**	**ROI +5**	**ROI +10**	**ROI +20**	**ROI +50**	**ROI +100**
5	**(0.0202)**	**-0.528%**	**-1.200%**	**-1.774%**	**-2.438%**	**-6.735%**	**-12.307%**	**-16.449%**
4	0.0025	0.596%	0.864%	1.376%	2.016%	6.823%	18.682%	26.549%
3	0.0090	0.778%	1.855%	2.359%	2.134%	3.440%	3.979%	15.781%
2	0.0159	-0.079%	0.027%	0.478%	1.417%	1.670%	3.520%	7.225%
1	**0.0302**	**0.407%**	**1.232%**	**1.771%**	**3.623%**	**8.216%**	**17.118%**	**22.147%**

FIGURE 2 *Mean VIX Performance by VIX Futures Slope Quintile*

CBOE, VIX and More

tile 2, while includes data from periods in which the VIX futures term structure is relatively flat, shows the VIX outperforming the median return for all quintiles across all time horizons. Also, while the VIX does show above average gains when the VIX futures term structure is in contango (decile 1), these gains are difficult to distinguish from those in quintile 3 or quintile 4. In fact, quintile 3, the middle quintile, shows the best aggregate gains in the VIX for all periods through five days—which is never the sign of a robust model.

Conclusion

Based on the decile and quintile analysis summarized above, there is compelling evidence that the S&P 500 index is a consistent outperformer when the VIX futures term structure is in steep backwardation. Similarly, the VIX consistently underperforms when the VIX term structure is in backwardation.

Unfortunately, the data make it difficult to extend the conclusions above even to the future performance of the SPX when the VIX futures are in extreme backwardation or the VIX when the futures are in extreme contango. Returning to the questions posed at the beginning of this article, the decile and quintile data are sufficiently noisy that I am prevented from establishing a linear relationship between the slope of the VIX futures term structure and future performance of the SPX or the VIX at this time.

That being said, the predictive value of the VIX future term structure at extremes has some interesting implications for traders. For starters, as far as the future SPX performance is concerned, extreme VIX futures contango presents some interesting opportunities for trades with a bullish directional bias and suggests that the need for portfolio protection for longs is minimal in this type of environment.

Turning to the performance of the VIX, perhaps the key takeaway is that while extreme VIX futures backwardation is associated with subsequent declines in the VIX due to mean-reversion, the degree of VIX futures contango has little bearing on the future performance of the VIX index. This conclusion should be of great interest for those who trade VIX futures, VIX options and VIX exchange-traded products. EM

Further Reading

"Exploring the VIX Futures Term Structure, Part I," *Expiring Monthly,* August 2010.

"An Interpretive Framework for VIX Futures (Second in a Series)," *Expiring Monthly,* September 2010.

"VIX Futures: Putting Ideas into Action (Third in a Series)," *Expiring Monthly,* October 2010.

"A History of VIX Futures Roll Yields," *Expiring Monthly,* September 2011.

"Investing Implications of the VIX Term Structure," *Expiring Monthly,* October 2011.

"Calculating the Future Range of the VIX," *Expiring Monthly,* February 2012.

reprinted from Feb 2012, vol. 2, no. 12

QUANTIFIABLE IMPLIED VOLATILITY SKEW

by
Jared Woodard
and Guest Contributor
Brandon Henry

The presence and significance of implied volatility skew is one of the most important and interesting aspects of listed options. We have covered this topic on many occasions in previous issues, so this article will not retread well-worn ground. Implied volatility skew refers here to the differences in the implied volatilities of options in the same expiration cycle with different strike prices.[1] While there are many competing attempts in the literature to model the behavior of changes in skew, these models should not be confused with *explanations*: the reason why skew exists, in options on any asset, is that market participants are only willing to trade contracts at some multiple of implied volatility above or below at-the-money levels. That participant order flow is the singular cause of volatility skew is practically a tautology.

[1] There are also differences in the implied volatilities of options across the term structure, e.g. between options with the same strike price in different expiration cycles. We do not examine directly the significance of time-based skew in this article.

The presence of volatility skew can be intuited from looking at any plot of the implied volatilities of options in a given expiration cycle (Figure 1). Visual scans of option implied volatilities are useful for determining *that* the values are skewed, and for finding excessively high or low individual points along the curve.

TD Ameritrade

FIGURE 1 *April SPX Implied Volatility Skew*

However, to determine whether skew is historically high or low, to determine whether the skew in one asset is rich or cheap relative to the skew in a related asset, or to derive any meaning in general from the steepness of the curve, it is helpful to quantify the skew in some normalized fashion. Finding an optimal estimate of volatility skew is no easy task: at least ten different formulas have been proposed in the recent literature, each with different statistical properties and economic value. The purpose of this article is to present and evaluate two such formulas for calculating implied volatility skew. After explaining the Trader and Mixon formulas, we show how each formula correlates with market returns and changes in ATM implied volatility and discuss practical applications of skew data.

TWO SKEW FORMULAS

In this study, we compiled historical option data to test and compare two formulas for estimating implied volatility skew.[2]

Trader Skew. The trader skew formula is: the ratio of the implied volatility of the put option with a delta closest to 10 to the implied volatility of the at the money (50 delta) put option, or:

10-delta put IV / 50-delta put IV

We're calling it "trader" skew because the value of the formula is primarily heuristic: the formula is easy to remember and simple enough to calculate mentally. Natenberg (1994) suggested dividing OTM put volatility by ATM volatility, but did not single out particular levels of delta or moneyness; Toft and Prucyk (1997) suggested the 10 delta level, but in the same formulation as the Mixon formula below (next page).

Over time, if you trade an asset regularly, this or some similar formula will be sufficient to let you know in an instant whether option skew is abnormally high or low. One obvious limitation of this formula is that, because it only incorporates data from one side of the curve, it is ill-suited to assets where a genuine smile is present: for an underlying like gold, where both OTM puts and calls trade at higher IVs than ATM strikes, the Trader formula

[2] Option prices on the S&P 500 Index (SPX) from January 2007 through January 2012 were recorded weekly at the strike prices corresponding to the delta levels under review. Where SPX data was corrupted or unavailable, options on the SPY ETF were used. Data was provided by TD Ameritrade.

does not incorporate all of the information the market provides. For options on assets like VIX, in which skew is present primarily on the call side, the formula can be applied using calls instead of puts.

Mixon Skew. This formula, presented in Carr and Wu (2007) and analyzed in great detail in Mixon (2010), takes information from both out of the money calls and puts relative to at the money values. The Mixon skew formula is:

(25-delta put IV – 25-delta call IV) / average 50-delta IV

There is an intuitive reason why we want to include data from call options in a skew estimate. Investors are not merely naked put buyers or hedgers: there are also inveterate call sellers. The heavy application of option collars (buying OTM puts and selling OTM calls against a long position in the underlying) indicates something about market sentiment that is not expressed via put data alone. To press the point further, we can imagine a market in which investors are not aggressively bidding up OTM puts, but are still selling near-term OTM calls with enough force to depress the higher-strike end of the volatility surface. Such a scenario is just as indicative of neutral-to-bearish investor sentiment as one in which put implied volatilities are elevated.

Data for any given expiration cycle can be noisy, especially as fewer days remain until expiration. To reduce the impact of large swings in skew estimates associated with expiring options, we only recorded data for series with at least 30 days until expiration. Because changes in vertical volatility skew were mostly present in near-term options and because historical data four months out and longer was often unavailable, we recorded only the front three months of skew estimates (i.e. the first three months with at least 30 days remaining). To make time series analysis feasible, we also provide three rolling averages of the data: an unweighted three-month mean value and two VIX-style weighted averages with 60- and 90-day horizons. The time series of these indexes for the two formulas are provided at Figures 2 and 3.

Notice that both formulas include at the money implied volatility values. This is an important feature. The reason for including at the money data is to normalize skew estimates for any changes in the nominal level of implied volatility—in the jargon, to preserve scale invariance. We could, instead, track the difference between 10-delta put and call implied volatility, but this latter approach will vary primarily with changes in the overall level of IV. Without such a normalization mechanism in place, skew estimates will be high whenever implied volatility is high, and low when volatility is low, making the skew estimate unhelpful as an indicator of the steepness of the curve. Figure 4 shows the time series for a 10-delta put IV—10-delta call IV skew estimate, weighted at a constant 60-day horizon. As you can see, this skew estimate mostly just tracks long-term swings in SPX implied volatility—it is redundant. Because mean prices, volatility, skewness, etc. are all characterizations of the same data set, some redundancy is to be expected; an optimal formula that analyzes some higher moment of an underlying distribution will be one that better equips us to understand and interpret the data.

COMPARING THE FORMULAS

There are pronounced differences between the Mixon and Trader methods of skew measurement. The differences are initially most visible on a simple time series comparison. The weighted 60-day Mixon calculation has maintained a steady uptrend since 2007, whereas the 60-day Trader algorithm actually bottomed twice after 2007: once immediately before the market free-fall in 2008, and once surprisingly in early 2009. While the

Figures 2–4: Condor Options

FIGURE 2 *Mixon Algorithm: Average, 60-Day, 90-Day Weightings*

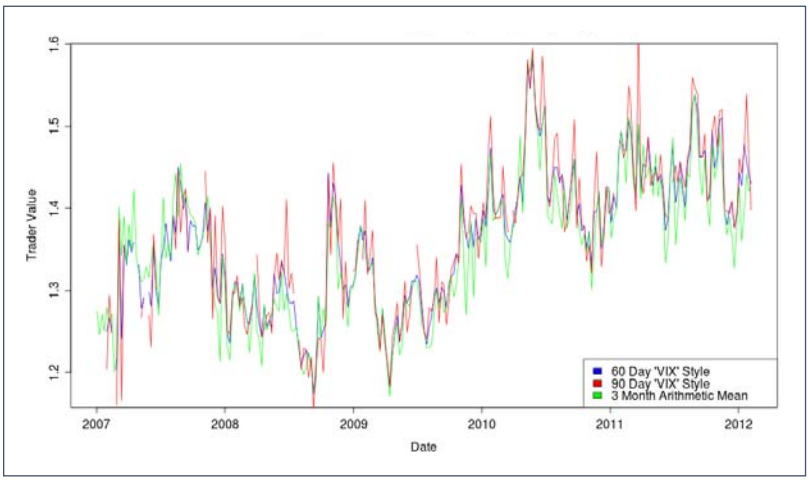

FIGURE 3 *Trader Algorithm: Average, 60-Day, 90-Day Weightings*

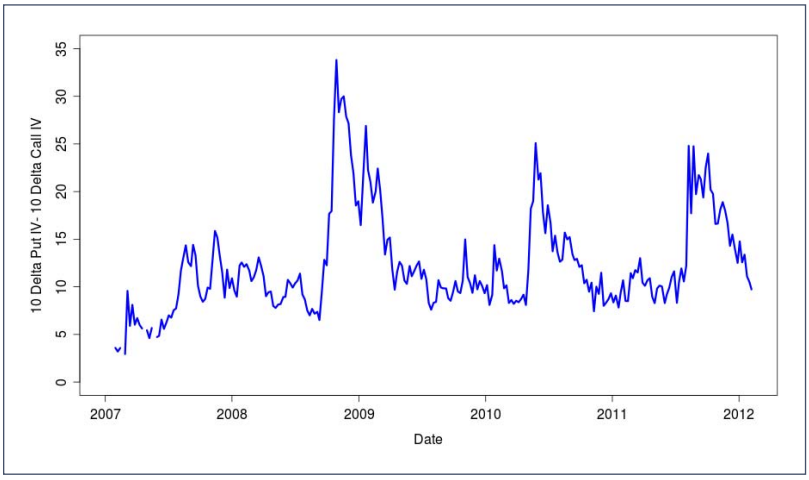

FIGURE 4 *10-Delta Implied Volatility (Put-Call): 60-Day Distance Weighted Estimator*

Mixon index does reach minima at these points as well, its relative position is very different when compared to 2007 levels. The peaks were both reached immediately after the "flash crash" on May 6, 2010. We do speculate on the cause of the high level of Mixon skew in recent years, although a similar phenomenon has been observed in SPX implied correlation—remaining "stuck" at an historically high level after the 2008 market crash and particularly after May of 2010.

In terms of the distributions of the skew results for each formula, the Trader calculation appears to exhibit more rightward skew, whereas the Mixon counterpart is more symmetrical, if not slightly leftward skewed. This indicates that the Mixon indicator has a higher propensity to show a low skew number relative to its mean than when compared to the Trader formula.

A point in favor of Mixon skew is that delta levels nearer to the money are likely to describe more liquid parts of the distribution of option prices and to be less vulnerable to the effects of outliers, providing more confidence in the statistical value of skew observations. For assets like SPX, further OTM options are plenty liquid and these concerns are not so urgent, but when applying skew formulas to options on individual equities or to thinly traded commodity options, any difference in the reliability of 25-delta option prices versus 10-delta option prices is more likely to matter.

SKEW, PRICES, AND VOLATILITY

Analyzing the correlation between changes in implied volatility skew and asset price

Figures 5–7: Condor Options

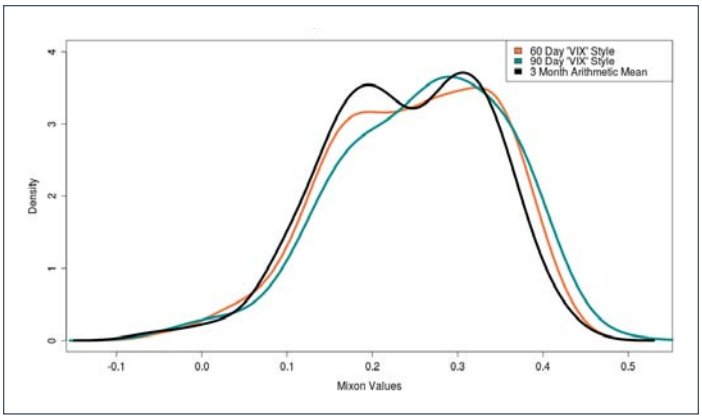

FIGURE 5 *Density Smoothed Mixon Values*

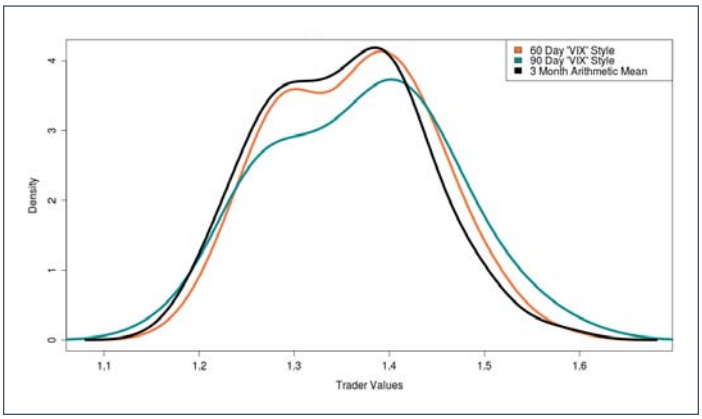

FIGURE 6 *Density Smoothed Trader Values*

changes revealed significant differences between the two formulas. The change in the 60-day Mixon indicator consistently posted higher correlations to changes in the SPX, whereas the 60-day Trader indicator displayed nothing more than essentially zero correlation. A comparison of the correlations is at Figure 7. Notably, the correlation for the 4-week change in the Mixon indicator regressed to a 4-week change in the SPX shows a decent (relatively speaking) correlation of 0.17. The Trader formula is challenged to be better than random. In fact, none of the regressions on the Trader formula indicate any statistical significance (p<0.05). The Mixon indicator

	R^2 Values	
SPX Returns	**Mixon**	**Trader**
1-Week	(.065)	(0.000075)
2-Week	(.097)	.000071
4-Week	(.17)	(.012)

FIGURE 7 *Correlation of IV Skew with SPX Returns*

indicates unquestionable statistical significance for each regression. It is important to note that each of the correlations are indicating a negative relationship, meaning that an increase in skew correlates to a decrease in the price of the underlying asset, in this case the S&P 500 Index.

Another relationship we looked at was between changes in skew estimates and changes in the absolute level of at the money implied volatility. ATM IV correlations were remarkably similar to the SPX index comparisons, perhaps even better. Unsurprisingly, these correlations revealed a positive relationship between changes in skew and changes in the implied volatility. A table comparing the correlations is at Figure 8. Figure 9 plots the correlation of 4-week changes in the 60-day Mixon index with 4-week SPX changes. These correlations are very similar to those to the underlying, but with one notable exception. From two to four weeks, both indices reverse their positive relationship to form a stronger negative relationship. This indicates that as the time horizon increases, an increase in skew correlates to a decrease in ATM implied volatility. The input and order of regression was checked and confirmed here.

One way to interpret the data—although this is speculative—is that investor attitudes to OTM option prices may be "stickier" than they are for ATM levels. Investors who are disposed to buy OTM puts and sell OTM calls for portfolio hedging/income purposes may be less interested in altering or actively managing their

	R^2 Values	
SPX ATM IV	Mixon	Trader
1-Week	0.062	.000025
2-Week	.10	.00023
4-Week	(.17)	(.012)

FIGURE 8 *Correlation of IV Skew with ATM IV*

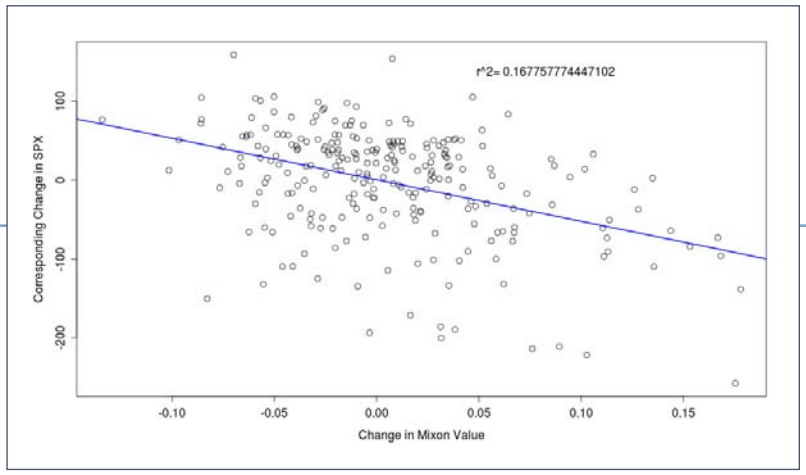

FIGURE 9 *4-Week Mixon Change (60d) | 4-Week Change in SPX*

Figures 8–10: Condor Options

overlays than are speculators trading ATM strikes directionally. Another possible explanation might be that markets in which ATM IV is falling—typically associated with declining price volatility—will spur traders, on balance, to keep applying put protection or collars after a certain period in order to protect gains; this would keep the skew curve relatively steep even while ATM IV could decline.

SKEW AND COMPLACENCY

One piece of folk wisdom held among some traders is that low levels of volatility skew are evidence of complacency in the markets. The theory says that when investors become unwilling to hedge their portfolios with puts or to abandon upside price potential by selling calls, this is an indication that bullish sentiment has reached an unsustainable extreme and that a price correction is much more likely. Conversely, extremely steep levels of skew are meant to be precursors to a bullish or declining volatility market as excessive pessimism causes investors to pile blindly into puts. A brief survey of skew commentary online suggested that this theory has been particularly popular among proponents of subjective/qualitative technical analysis and Elliot Wave theory. To get a closer look at the predictive value of implied volatility skew for subsequent market returns, the weekly observations for the two formulas were divided into quantiles and compared with SPX median returns one week later, as shown in Figure 10.

As shown here, there was no meaningful difference at the one-week horizon between either skew formula and the median SPX return overall. This is consistent with the correlation study discussed above, which also considered longer time-frames. Note that while the Mixon formula proved to be the more predictive of the two, its absolute value as a market timing indicator was low (R^2 of 0.17 at a four-week horizon). While there may be other methods of incorporating skew information into a market timing rule set, the evidence available indicates that levels of volatility skew are not indicative of future price returns. Annotated, seemingly predictive skew charts may just amount to data mining in the service of a good story. Alternatively, we noted that some applications of the complacency theory by technical analysts relied on skew formulas that, like the 10-delta put/call difference formula already mentioned, actually function as redundant estimates of absolute implied volatility. Since implied volatility *has* been related to subsequent price returns for many assets including equities, it may be that complacency theory advocates are making a sound argument entirely by accident. A chef who calls foods by all the wrong names may still be able to serve up a worthy entree.

Quantile	Trader	Mixon
1	2.034%	1.789%
2	2.119%	2.894%
3	1.375%	1.213%
4	1.846%	1.846%

SPX Any time: 1.846%

FIGURE 10 *SPX 1-Week Median Return*

PUTTING SKEW TO GOOD USE

Leaving aside the question of market timing strategies, investors have several ways to use implied volatility skew data to inform trading decisions. One practical application of skew data is in the timing and creation of portfolio hedges. Popular hedging methods like option collars are often applied and rolled based only on the calendar. Instead of, for example, rolling an SPX option collar forward every quarter to keep a stock portfolio protected, investors can use skew data to inform those trades. Applying collars when skew is historically low will reduce costs, and scaling out of collar or put protection as skew becomes steep will maximize gains from those trades. Another approach is to apply normalized formulas like Mixon to several different viable hedging candidates to determine which offers the cheapest options in terms of skew. On the speculative side, skew data should inform the structure of volatility-based trades. Imagine that you believe implied volatility in general is too high relative to likely future volatility, such that a net options sale is in order. You could sell an iron condor with strikes placed far out of the money, or you could put the same amount of capital at risk in a butterfly, selling at the money implied volatility and buying nearby protective wings. When skew is high, meaning that out of the money options are richly priced, the condor trade will have a better expected return; conversely, low skew gives you the clearance to trade the butterfly.

One reason we chose to observe option prices on a weekly basis to perform the analysis here was so that the results would be relevant to the practical needs of most investors. Collecting and analyzing skew data on multiple assets on a daily basis would be onerous for most individuals, but checking on changes in the steepness of the curve on a weekly basis is not so difficult. Several brokers and trading platforms will display current volatility skew charts, and Livevol Pro displays skew charts using historical data as well. A newer tool from iVolatility called IVGraph displays time series charts of volatility skew measured by moneyness, which is an interesting feature. EM

Brandon Henry *is a sophomore Physics and Economics major at Middlebury College in central Vermont. Originally from Colorado, he has experience trading futures and equities in a variety of styles incorporating technical analysis, Auction Market Theory, and volatility. He is the chair of the young derivatives and risk management component of the Middlebury Student Investment Committee. He intends to use his talents in statistics, physics, and computer programming to pursue a career in financial engineering. He is a former Junior Olympic Nordic skier and junior Colorado state cycling champion.*

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reprinted from Sep 2011, vol. 2, no. 7

To view this video go here

Expiring Monthly Interview with Jamie Tyrrell

Mark Sebastian

Jamie Tyrrell has been a CBOE member since 2006 and for five years has been a CBOE Volatility Index options (VIX) specialist on behalf of Group One Trading—one of the largest proprietary options trading firms in the U.S. and the Designated Primary Market Maker in VIX options and other products.

A regular contributor of market color for CNBC, Bloomberg, and other financial news outlets, Jamie previously also traded equity and SPY options.

Prior to joining CBOE, he was involved in financial management at Accenture, after studying political science and business at the University of Notre Dame.

Expiring Monthly: *Tell us about yourself.*

Jamie Tyrrell: I work for Group One Trading, the designated primary market maker on the CBOE for VIX and VXX options. I am one of the DPMs that trades VIX and the VIX ETNs.

EM: *How did you get into trading?*

JT: I got into trading with Group One. I enrolled in their training program. Started as a clerk for a year, and then started as a junior trader in the DPM. Eventually I became a full trader in the VIX DPM.

EM: *Talk a little bit about the daily routine of the VIX options from open to close.*

JT: The VIX is obviously derived off of SPX options, so every morning I come in and look at what the S&P 500 has done overnight, what kind of range it has had and where it is heading leading up to the open. VIX futures open at 7:20 (soon to be 7:00) and VIX options open at 8:30. The first hour of the day is typically the busiest as customers adjust options positions and we take the other side of their trades. We also have an uptick in activity around 10:30 central as European indexes are closing down and European customers turn their attention to VIX. The lunch hours are the slowest and then after 2:00 p.m. there is usually another burst of activity heading into the close.

EM: *Talk to us about the difference between trading a cash settled index. Do you think trading VIX is more like SPX options or options on say, Apple or Best Buy?*

JT: I think it is more like trading SPX options. In individual equities, traders are really looking at company specific news to drive their markets. In VIX and SPX, we see the same kind of macro news events drive customer paper. Lately there have been big moves in vol in both VIX and SPX after announcements out of Europe or the Fed and after 9:00 a.m. economic numbers.

EM: *How do you manage movement in futures? The spreads between different months can really change.*

JT: In the VIX, to keep things clean market makers will often hedge each individual option trade with that month's future. Market markets typically hedge September options with September futures, October options with October futures. The reason being you

can see giant moves between the front couple months' futures. Over the last few days we have had the September decline $4 and the October decline $1, so the spread between the months moved $3. There are many VIX customers who trade the one future against another, but they trade the spreads between the different futures as more of a directional prop play and not as a direct hedge to option trades. A customer who hedges an October trade with a September future is really making a play on if backwardation continues or if we go back into contango, rather than hedging delta.

EM: *Do you ever see the SPX firms using the VIX product to lay off risk on what's going on the big product?*

JT: Certainly, you will see the activity in upside VIX calls which is very highly correlated to downside SPX downside puts. There will be spreads quoted in the pit where a firm will want to trade those products as a spread where they will want to buy a VIX call and sell SPX put (or vice versa) because they think one is over-priced and under-priced.

EM: *What is the institutional customer base in VIX like, highly sophisticated, or a mixed crowd?*

JT: I'd say the players who play VIX are larger. We see a lot more retail interest in the VIX ETNs, just because of the barrier to enter in futures execution capabilities. We tend to see very large customers in the VIX. More of the 1, 5, 10 lot gravitates towards the VXX and VXZ.

EM: *What are some of the major complaints you hear from retail customers?*

JT: I think the VIX is complicated, so we will get frustrated retail customers who start to trade the VIX options without realizing September options priced off of September futures and are not priced off of the VIX cash. Retail customers really need to read up on the VIX and understand the term structure before trading it.

EM: *In general, how have the VIX ETNs affected trading VIX futures and options?*

JT: The VIX ETNs are driving more volume into VIX futures. More firms are now looking at the VIX futures and making markets in them. Markets have expanded getting tighter and deeper. That has enabled option market makers to make deeper more liquid markets in the underlying options. The VIX option trading crowd can handle bigger orders now because the VIX futures are more liquid, which has been huge in the increasing the popularity of VIX.

EM: *At the close of business there is a lot of interesting activity. I assume you watch the futures. What effect does the ETNs rolling out futures have on options trading?*

JT: In the last 30 seconds of trading every day, there is a huge amount of volume in VIX futures, especially the front two months. That volume that you see at the end of the day isn't driving options trading, it's traders covering their exposure in VIX ETNs. Every day the value of the ETNs is calculated off of the closing price and by sending in orders at the very end of the day, traders are trying to capture that closing price. But, does that volume have much of an effect on options trading? I would say for the most part, no.

EM: *As the host of Volatility Sonar, you must get a lot of questions from the general public. What are common misconceptions that people have? People should know before trading?*

JT: The term structure is something a lot of outside investors don't know a lot about. A lot of investors start to look at VIX and want to trade

the cash VIX and don't understand that the VIX cash is just a calculation and it can't be bought or sold. I think traders need to be familiar with the idea that VIX options are options on futures and not options on the VIX cash before trading VIX.

EM: *Would you say the SPX volume leads the VIX or vice versa? Or is it more of a which came first, the chicken or the egg in terms of trading?*

JT: It used to be much more so that you would see SPX activity long before we would see any resulting play in VIX. Now, there are many times traders will put on a position in VIX and then SPX. In long run, SPX volume really in some ways needs to lead the VIX. VIX is derived from the SPX options; VIX settlements comes from the prices of SPX options. The VIX has been created as an outgrowth of SPX activity and I think the success of VIX can lead to more trading in SPX options as well.

EM: *Let's talk about settlement. Sometimes there are some idiosyncrasies with settlement. What advice would you give an outside trader and what do you do to prepare for settlement?*

JT: VIX settlement is something that is hard to predict based on the VIX cash. In September VIX is settling entirely to SPX October options. Take all the bids and offers in October options you will get a bid and ask on the VIX, and SPX bid-asks can be a couple of dollars wide. It is hard to predict with great certainty where the VIX will settle. The order flow we see in morning SPX will greatly determine to great degree if the settlement will be higher or lower than expected.

EM: *Jamie, you started trading with Group One in the 2006, you have traded almost exclusively the VIX products in the pit since then. What has the progression been like for the product and for you as a trader since 2006? In that time the product has moved from having a lot of potential to being a full-fledged blockbuster.*

JT: It's been really interesting to watch the product grow. The physical pit has moved twice. It started as one trader no brokers. Then 8 traders and brokers all around. Then a second pit had 20 traders and 5–10 brokers. The current pit has 40 market makers and 20 brokers coming in to do business all day. VIX options volume has gone from under 100,000 contracts to a day 400–500 thousand. Volume in VIX futures has increased from 3–4 thousand contracts to over 50 thousand since I have been there. With that increase in activity the markets have tightened and different players have begun trading the product. Now, a new class of investor is interested in VIX, big banks, doing 50 thousand options at a clip. Three years ago they had the trouble finding liquidity to do a decent sized VIX spread. And now a VIX call could trade inside of the screen market for 50 thousand contracts and not see much change in the volatility or futures price.

EM: *Where do you see the VIX products and vol products going over next few years?*

JT: The VXX, the first ETN that Barclay launched on VIX futures has been very successful in term of volume. Recently, there have been even more ETNs coming into the volatility space. VIIX, VIXY, VXZ, all of them have options on them that trade in the VIX pit. I think more ETNs launches are possible with options. Inverse VIX ETNs trade a lot of volume, but I don't think we'll see options on them in the near future. A number of index VIX calculations have been launched, including the Gold VIX (GVZ) which trades off of the GLD like VIX trades off of the SPX. I think it's possible we could have more sector VIXs launched in the pit.

EM: *Do you think there is a potential with weekly VIX futures options?*

JT: I think there definitely is. Group One is the DPM for that product as well. The one issue is that it trades on the CFE. I think it is a matter of getting brokerage futures to get access to CFE. This is the first option product listed on CFE, so many customers do not have access. As that changes I see many of the same players entering the VIX futures options.

EM: *Is there anything else you would like to add/say you know how do you like market making the VIX?*

JT: It has been an exciting 4 years that I have been in the pit. I have seen the product mature with lots of new customers and new brokers coming into the product and change the way that it has traded. It has been interesting over the last 18 months; VIX futures really picked up. They are now more liquid and can be a driver of option volume. EM

Long-Short Straddles on Two Major Market Indices

Bill Luby

IT IS TIME ONCE AGAIN for what I call a "proof-of-concept trade." Since I rarely trade options in the major market indices, this month's Follow that Trade seemed like a good time to take some of the ideas that cropped up elsewhere in this issue in *Comparative Implied and Realized Index Volatility* and turn them into a trade.

Background and Rationale

In my article on implied and realized index volatility, I noted that since the beginning of 2009, the RUT (Russell 2000 Index) and RVX (CBOE Russell 2000 Volatility Index) pair has consistently demonstrated the lowest volatility risk premium (VRP) among the major market indices, while the SPX (S&P 500 Index) and VIX (CBOE Volatility Index) have generated either the highest or second highest in each of the past three years. The rationale for this trade is simple: play the VRP differential game by going short SPX straddles and long RUT straddles in the same notional amount.

Setup and Entry

Having established a bias in favor of shorting SPX straddles and going long RUT straddles, I searched for a setup in which the VIX was considerably higher than average relative to the RVX than it has been for the last eight years. As it turns out, there were a number of instances that fell into the category of a high VIX relative to the RVX from August 2011 through the beginning of January 2012, but during the last three months these readings have hugged the historical mean tightly.

While I had every intention of waiting for a large spike in the VIX relative to the RVX, fatigue and lowered expectations finally got the better of me on April 10, when the VIX:RVX ratio hit a two month high, even though this high was only in the 59th percentile of data from 2004 to the present.

I selected ATM straddles for the month of May, rounding up to the next strike in both instances. At the close on April 10, the RUT was at 784.15 and the May 785 straddle was 50.65; the SPX was at 1358.59 and the May 1360 straddle was 62.80. So that the notional dollars were approximately equal, I bought 10 contracts of the RUT May 785 straddle at 50.65 and sold 8 contracts of the SPX May 1360 straddle at 62.80. Keep in mind that while the relative positions are fairly large ($50,650 for SPX and $50,240 for RUT), the actual dollars at risk in this transaction is relatively small, given the historical correlation of .985 between these two indices.

Position Management

In managing this trade, I paid particular attention to the direction of the moves in the VIX and the RVX as well as the magnitude of the changes in the two volatility indices. My assumption was that with both volatility indices slightly elevated relative to their recent ranges, the most likely scenario was that both the VIX and the RVX would decline and the trade would be a winner if the decline in the VIX would be able to keep pace or almost keep pace with the decline in RVX.

April 11—Right off the bat, both volatility indices declined, yet the net value of the position declined $12. This is an early warning sign, but only a mild one at this stage.

April 12—For the second day in a row, the equity indices rose and the volatility indices declined. Today there was a big difference in the magnitude of the moves in the volatility indices, with the VIX falling 14.1% and the RVX falling only 8.2%. My hypothesis was that a move like this should greatly enhance the profitability of the trade. Instead, the loss grew from $12 to $27 and larger warning flags went up.

I like to think of my options strategies . . . as a portfolio of strategic experiments on the margin.

Date	RUT	RVX	May 785 P	May 785 C	May 785 Strad	P / L	May 1360 Strad	May 1360 C	May 1360 P	VIX	SPX
4/10/12	**784.15**	**26.88**	**25.55**	**25.10**	**50.65**	**0.00**	**-62.80**	**32.05**	**30.75**	**20.39**	**1358.59**
4/11/12	796.59	26.38	21.25	30.40	51.65	**-12.00**	-63.05	28.45	34.60	20.02	1368.71
4/12/12	808.59	24.23	14.35	39.45	53.80	**-27.10**	-62.25	17.30	44.95	17.20	1387.57
4/13/12	796.29	26.11	20.55	29.45	50.00	**26.90**	-60.25	27.00	33.25	19.55	1370.26
4/16/12	798.08	26.55	18.90	30.55	49.45	**44.40**	-58.75	26.45	32.30	19.55	1369.57
4/17/12	810.63	25.25	14.45	36.50	50.95	**9.80**	-61.20	18.05	43.15	18.46	1390.78
4/18/12	803.32	25.81	16.45	31.10	47.55	**69.40**	-58.00	18.75	39.25	18.64	1385.14
4/19/12	798.90	25.51	16.60	28.90	45.50	**123.50**	-53.80	19.85	33.95	18.36	1376.92
4/20/12	804.05	23.96	13.30	30.95	44.25	**155.20**	-51.40	17.20	34.20	17.44	1378.53
% change	**2.54%**	**-10.86%**	**-47.95%**	**23.31%**	**-12.64%**		**-18.15%**	**-46.33%**	**11.22%**	**-14.47%**	**1.47%**

CBOE, thinkorswim/TD Ameritrade, VIX and More

FIGURE 1 *SPX-RUT Straddle Summary*

April 13—This time the equity indices fell and the volatility indices rose. The good news is that the straddles, which have come to be dominated by the valuation of the put leg, have finally slipped below their opening prices and for the first time the net position shows a profit: $26.90.

April 16—Monday's trading favored the RUT, with the RUT rising and the SPX falling. The VIX was unchanged, but the RVX rose 1.7%. Both straddle prices continued to decline and the profit grew to $44.40.

April 20—With both equity indices up only 0.7% for the week, it has been a relatively slow week. Both volatility indices, however, have declined sharply for the week, with the VIX down 10.8% and the RVX down 9.8%. The steady decline in volatility expectations has gradually eroded the value of both straddles, with the RUT straddle down 12.64% from its opening value, while the VIX has declined 18.15% from its opening value. The profit in this trade is now at its highest level since the trade was opened: $155.20.

This is the result that I had hoped for and for that reason, I believe it is time to take at least partial profits, if not close out the position entirely. As this is first and foremost a proof-of-concept trade, I will continue to leave the ledger open on this trade and see how it develops during the final four weeks prior to expiration. At this stage of the game, I expect the educational value of monitoring this position for another four weeks to be more important than the potential profits that can be wrung out of it. Should some particularly interesting insights come out of this, I will revisit this trade in a future issue.

Epilogue and Takeaways

Part of the reason I like these proof-of-concept trades is that they force me out of my comfort zone into areas of trading with which I typically have only some minor familiarity. In the case of this comparative volatility strangle, I see a need for strategy analytics (evaluating how this type of trade would have performed in the past and adjusting the rules for entries and exits as appropriate) to be combined with actual one-off proof-of-concept trades such as the one outlined above.

Of course there are huge risks in generalizing from one small set of data points, but I like to think of my options strategies not necessarily as a fixed set of trading approaches that have the best backtested and/or real-world results, but rather as a portfolio of strategic experiments on the margin. Proof-of-concept trades are one way of implementing those strategic experiments which often provides valued feedback on a current strategic focus or points the way to new strategy ideas.

In the case of SPX-RUT straddles, I think the volatility risk premium and relative volatility approach has some merit and another round or two of strategic experiments is warranted. EM

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Slow Days

Andrew Giovinazzi

AS THE VIX BRIEFLY dipped below 15% this week it made me think about how I used to pass the time on slower days when I was a market maker. There is a misconception about floor trading in that it is busy and hectic all of the time. That is not entirely true. When the volatility dies down and some of the seasonal slowness comes in the hyper group of adrenaline junkies known as floor traders find themselves with extra time on their hands and not much to do. Sure the market is trading and ticking but what really counts is the velocity of orders hitting a trading floor at any one time. If that velocity slows to a trickle something has to give.

After all, that was a trip to Mexico so what is wrong with a shaved head anyway?

Think of trading floors as big locker rooms since it is mostly men (some women). This is a group predisposed to betting so when the quiet comes guys start to come up with interesting things to bet on. This scene was made famous in Liar's Poker in the late 80s. The bond trading room at Salomon Brothers had some impromptu Liar's Poker for big bucks. Floor traders looked for more interesting things to bet on since part of the goal was to kill time. Half of the fun was coming up with something good to bet on. Normally it had to consist of something verifiable on the floor itself. That was part of the fun. Also there was usually some sort of mildly sadistic quality to it. Since there was a steady stream of clerks who needed extra dough there usually was always a willing taker.

Take one of my favorites. Send a clerk around to collect bids to shave their head. First, some time got killed finding a clerk who would shave their head for money. You throw out a couple of bids, $100, $200 etc and no takers. Then the guys would get together and up the ante a bit, say $500, and still nothing. Ramp it up to $1000 and then there was some interest. After all, that was a trip to Mexico so what is wrong with a shaved head anyway? One hour later the clerk comes back bald as a cue ball. Most of the day was happily over.

Eating contests were pretty popular too. Eating hot sauce or drinking a gallon of milk, stuff like that. The CBOE has this great lunch room with wall to wall windows so members could eat lunch and keep an eye on the action in their crowds. It was one of my favorite places to have lunch (besides Ceres). On a slow day we came up with an idea of eating a 50-piece Chicken McNugget box in one hour for $500. I thought no way could anyone do that. We happened to be lucky enough to have a huge kid from the South Side clerking in the pit next to us. His boss, the broker, called him Tiny. He was not tiny. He took the bet like it was the easiest money he was ever going to make. We decided to have the contest in the members lounge and I wanted to see Tiny eat the nuggets from the pit since I could not leave the DPM. He was standing by the window wolfing down those nuggets. The first 30 minutes rolled by and he had scarfed down half of them and was looking strong. It was impressive. 40 minutes into it he started to slow down, really slow down and now the 20 McNuggets left looked as big as baseballs to Tiny. He sipped some milk. That was a bad idea because at about minute 50 he could not eat one more. I know because he tried to eat one more and out they came all over the members lounge window. It was spectacular. Only one hour to go in the day and the close looked like it was heating up.

As a trading note, be careful fading in a quiet market as things can change in a hurry once some liquidity starts to show up. EM