FEBRUARY 2012 | Vol. 2 No. 12

EXPIRING MONTHLY

THE OPTION TRADERS JOURNAL

SKEW in REVIEW

QUANTIFIABLE IMPLIED VOLATILITY SKEW

AN INTERVIEW WITH Henry Schwartz, CEO of Trade Alert

Volatility Phenomena and the Skew

Option Skew and What it Means to You

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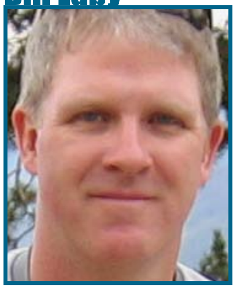
Bill Luby



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.

Editor's Notes

Bill Luby

This issue marks the end of the second year of publication for *Expiring Monthly*. As the magazine has grown and evolved, I have seen it take on a more scholarly tone and focus more on issues related to current events and the current options trading environment—however that may twist and turn according to global and macroeconomic events.

For the February issue the topic du jour is options volatility skew. Jared Woodard and guest contributor Brandon Henry skewer the subject in this month's feature article, *Quantifiable Volatility Implied Skew,* in which they evaluate two formulas for calculating implied volatility skew. I have little doubt that most readers will want to read this article at least twice and ponder the implications of some of the conclusions for their own trading strategies.

Also on the subject of skew, Mark Sebastian dissects 1 by 2 front spreads and explains how these are ideally suited to take advantage of opportunities presented by anomalies in the skew.

Two frequent contributors return to these pages once again: Russell Rhoads provides an overview of how the CBOE S&P 500 SKEW index is calculated and how to interpret it; Andrew Giovinazzi discusses the role interaction between market makers and supply and demand in determining the skew.

In our feature interview, Mark Sebastian talks with Henry Schwartz of Trade Alert and WhatsTrading.com in a discussion that focuses on order flow and the evolving role of exchanges and market makers.

This month I discuss some research that utilizes VIX historical data to help define the potential future range of maximum VIX prices—and the implications for VIX futures and options.

Elsewhere, Jared Woodard returns to one of his favorite subjects, volatility risk premium, and examines the persistence of a high ratio of implied volatility to historical volatility, along with the implications of this type of market environment for traders. Andrew Giovinazzi also reflects on his time as a floor trader and passes along some of the approaches used to train new options traders.

In this month's Follow That Trade column, Mark Sebastian puts a backspread trade under the microscope and against the backdrop of the ongoing debt/austerity negotiations in Greece.

Once again, the EM team is back to answer reader questions in the Ask the Xperts segment and Jared returns to the Back Page with an unlikely tapestry that weaves together Valentine's Day, the VIX and the SEC/CFTC regulatory divide.

As always, readers are encouraged to send questions, comments or guest article contribution ideas to editor@expiringmonthly.com.

Have a good expiration cycle,

Bill Luby
Contributing Editor

Ask the Xperts

The Expiring Monthly Editors

Q: *In the past, I have avoided options as I have not been able to quantify potential strategies and so I could never get past buying volatility and losing time decay, or selling volatility and having a risk that is much higher than the reward, even though risk may be limited and the win rate may be high. Are there any good techniques for managing a short vertical spread that goes against you?*

—D.P.

A: This is a question that frequently comes up. If you put on a vertical spread for a 20 cent credit, it's no fun at all to watch the underlying move against you until you have to spend 1.80 to close the position. However, the short answer is that any reliable stop-loss or other management strategy will have equivalent returns over time to a solid up-front combination of spread construction and capital management. In other words, in my experience the entries matter much more than the exits. I've seen a lot of traders spin their wheels looking for the ideal "adjustment" approach, when careful position sizing and the use of risk-defined spreads takes care of most of the work.

—Jared

Q: *When and if you have a second, I'd like your opinion on selling VIX puts in the current environment.*

Related question—you had a post on selling puts that uses an optionsXpress matrix. Any suggestions for those of us who are not optionsXpress clients? Any (free) publicly available matrices? Easy DIY matrices?

—Keith R.

A: Regarding VIX puts, this is a great idea in theory, but when you check to see how little you get for these (ATM and OTM), you will no doubt be surprised by the low profit potential. Given the relatively small reward and potentially large risk, I am generally not a fan of selling VIX puts with a historically low VIX—particularly in an environment with substantial overnight risk from events in Europe, China, Iran, etc.

As for a put matrix, you can assemble your own by vising Yahoo Finance and clicking on the options tab for ^VIX. Alternatively, and potentially a much better solution, I believe you can still open up an account at optionsXpress and use all their functionality in a paper money account, regardless of whether or not you fund the account. If you do this, you should be able to create your own optionsXpress put matrix, perhaps in as little as five minutes after signing up. That being said, I suspect that when you see the full range of tools available, you will be inclined to fund the account so that you can fully integrate the tools with your trading.

As an aside, other options brokers may have a similar put matrix feature, but no other examples immediately come to mind.

—Bill

Q: *My brokerage platform does not offer a way to trade skew or look at skew, and ideas on how I could track skew in order to trade directional spreads?*

—Jim

A: I think the best way to try and trade skew, when one does not have a visual, is to create a visual. Many platforms will let you export data. Another 'dirtier' way to trade skew is to not look at the vol itself, but to look at the IV spreads between strikes. If a grouping of strikes on the Put curve is all separates by 2% and you find one strike that is only 1% above the strike higher and 3% below the strike lower, you have found a candidate to buy.

—Mark

Follow-Through in Monthly

Volatility Risk Premia

Jared Woodard

AT ANY GIVEN TIME, chances are that if you sell an option on some asset and keep a tight delta hedge in place, you will earn a positive return at expiration: the premium in the option will have been greater than the cost of replicating that option using the underlying asset. The difference between the price of the option and the cost of replicating it, the volatility risk premium (VRP), is something I have discussed in these pages and elsewhere on several occasions. The consensus in the literature from both academics and practitioners alike is that this premium exists, and is economically significant.

The fact *that* such a risk premium exists is not, however, of immediate value to any trader. If this source of abnormal returns is only available at certain times or under certain conditions, or if the tail risk from VRP-exploiting strategies is too great, then it would be helpful to know when to expect VRP-oriented trades to be profitable or not. Put another way: we can measure whether the VRP has been positive or negative in the past, but does that measurement tell us anything about the future? To see whether options some *n* periods ago were cheaply or richly priced, we only need to compare the implied volatility of those options with the *n*-period historical volatility. For example, if the annualized implied volatility of an at the money put was 34% one month ago, and the historical volatility over the past month (whether estimated using close-close prices, Yang-Zhang volatility, or some other method) was 36%, the costs of hedging position delta would have been greater than the premium received from selling the option. How we estimate historical volatility is not a trivial matter, since there is a delicate balance to be struck between minimizing the exposure to jump risk and minimizing the costs associated with very frequent delta hedging. But the problem I am focusing on is that, even if we assume an accurate and practical historical volatility estimate, what, if any, expectations can we form based on measurements of VRP?

To avoid letting the data-crunching get in the way, I thought it would be helpful to lay out what kind of answer we're looking for. Let's say you subtract the implied vol of an option one month ago from the historical vol of the underlying from that day to the present, and find that the VRP has been very positive. In other words, it really would have paid to have been an option seller. From a data-gatherer's perspective, the next step might be to check on the relationship the following day, i.e. the lagged one-month IV minus the one-month HV looking back from tomorrow's date. But this approach will never be helpful to a trader, since we will always be dealing with old data, and we can only make trades in the present. What we want, instead, is to look for a relationship between some historical VRP comparison and the VRP on a trade initiated today.

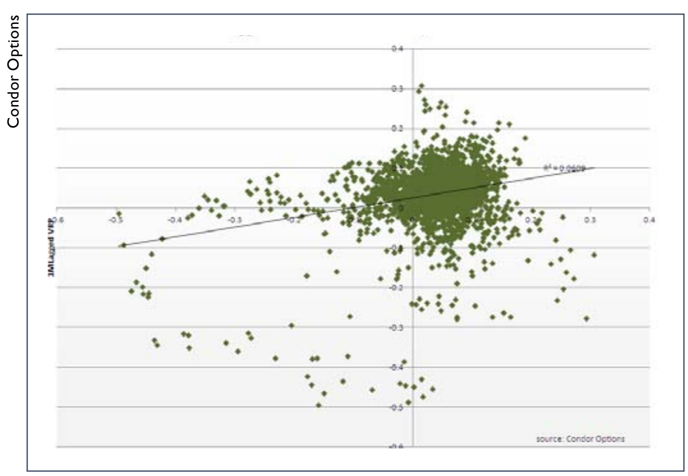


FIGURE 1 *Lagged and Forward 1M SPX VRP, 2000–2012*

Figure 1 is a scatter plot of the one-month lagged and forward daily VRP estimates for SPX options from 2000–2012. It's a mess, and the r-squared value of the linear regression tells us that, on any given day, the VRP from selling options one month ago and delta hedging doesn't tell us anything particularly

Condor Options

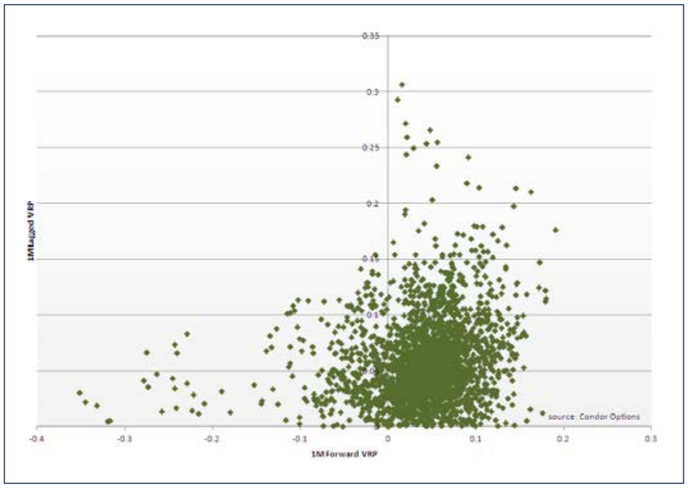


FIGURE 2 *Lagged>0 and Forward 1M SPX VRP, 2000–2012*

1M Forward SPX VRP			
1M VRP>	**mean**	**median**	***n***
any	0.0351	0.0419	3004
0	0.0393	0.0424	2446
0.01	0.0398	0.0427	2317
0.05	0.0490	0.0518	1262
0.1	0.0557	0.0602	310

FIGURE 3

meaningful about the likely return from initiating such a strategy today. I should mention that traders who take an "always on" approach to option selling are not in a bad position here—even with the extreme negative values you can see on the chart, the median difference between implied and historical volatility was more than four points. Knock off a percentage point for slippage and transaction costs and you still have a positive return for not doing much of anything.

I noticed that many of the extreme observations for forward VRP (the P/L you achieve by initiating a trade today) occurred when lagged values were negative. What if we only take "trades" on days when the lagged VRP is positive? The distribution of results was not much changed (Figure 2), the r-squared value was lower, and the effect on mean and median returns, while positive, was not substantial. However, filtering results even more stringently did produce some noticeable differences (Figure 3). Selling options today when the prior month's VRP was greater than ten percentage points saw a median difference over the next month of 6 points. The number of signals was dramatically reduced, which is a negative from the standpoint of statistical significance, but is a positive factor from the standpoint of execution.

These results are consistent with the intuitive idea that when option premiums are particularly rich, they will continue to be so until some significant change in the movement of the underlying asset makes them cheap. I also take this data to support the view that the best time to sell options is not necessarily when implied volatility is high in absolute terms, but when the ratio of implied to historical volatility has already proven itself to be favorable to traders.

In terms of practical implementation, traders could use these results as an input for position sizes in volatility selling strategies using straddles, iron condors, or time spreads, taking persistent and small positions in most markets, but scaling into larger trades when the lagged VRP ratio suggests a favorable environment. EM

Related Reading

Woodard, Jared. "The Volatility Risk Premium in Commodity Options." *Expiring Monthly*, November 2010.

Woodard, Jared. "Trading Ranked Volatility with Non-Directional Spreads." *Expiring Monthly*, February 2011.

Woodard, Jared. "Trend Following with the CBOE VIX Premium Indexes." *Expiring Monthly*, July 2011.

Woodard, Jared. "The Yang-Zhang Estimate of Volatility." *Expiring Monthly*, June 2010.

Trade Set-Up Shorts:

The 1 by 2 Front Spread

Mark Sebastian

WHAT MAKES a good skew trade? Believe it or not, it's the same answer as what makes a good spread. What makes a good spread? Spreading volatility in an efficient and effective matter and being right on direction . . . or at least not wrong on direction. However, trading skew can help a trader absolutely maximize his or her ability to make money if one is wrong on direction, and can product a good trade that can win regardless of the way the underlying moves. The best way to do this is with a 1 by 2 front spread.

In past articles I have discussed how one can use skew to improve a vertical spread. The basic concept of the article was that traders should pick the direction they are trying to trade. Then decide if they want to be short Vega based on volatility, or, if implied volatility is depressed, own vega (this is different than the term debit spread or a credit spread because there is no such thing as either). Finally, find an area on the curve where the volatility is relatively cheap and buy it. Against that long, sell the most expensive call on the curve. We can see the spread set up in AMZN here (Figure 1).

Notice that we find the inflection point on the curve where we buy and then the next strike where there is a small uptick in IV along the curve (in relative terms). This one is a little obvious, but in almost every spread trade there is a point that should be bought and a point that should be sold. The value can add up to .05 or more in the spread. Done over the time the trader can really improve his or her chances of success.

Moving on to a 1 by 2 front spread we can see how this type of approach can really create edge. A trader is getting the chance to overweight the overbought strike against a somewhat cheap strike. It also allows for so much more though. The trade can be long gamma *and* short vega at the same time. It can be long delta for a credit. It can be a directional trade that wins in both directions or even if the trade sits.

So how does one put together a proper front spread?

1. Decide to get short the volatility: A front spread on its own is a great way to take advantage of a pop in volatility on a stock or index. This trade works for this situation because it provides the trader with an ample amount of space to manage the delta if the underlying keeps going.

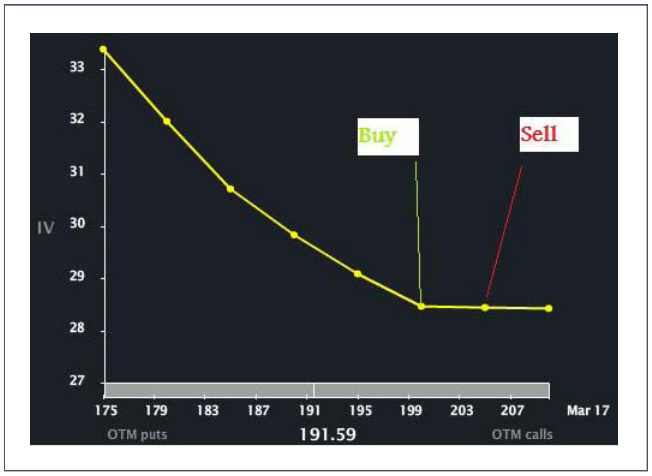


FIGURE 1

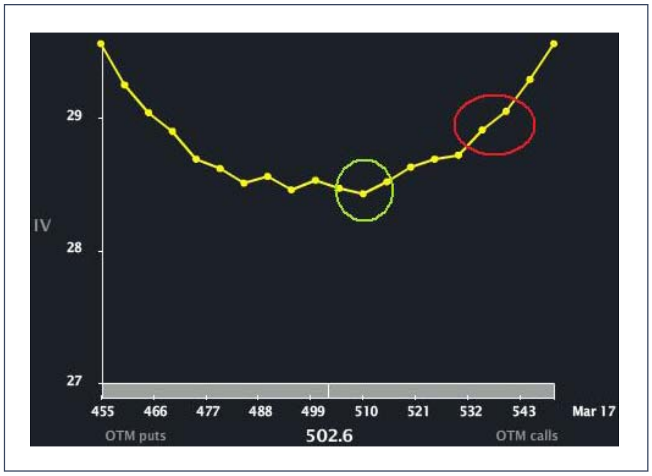


FIGURE 2

2. Find the inflection point: If the trader doesn't find a cheap strike the trader will defiantly find a strike that is more expensive. We can see a clear spot of cheap vol vs. expensive volatility in Figure 2.

3. Do the trade for even or better: One key to a good front spread is to *not* pay for it. By doing so the trade will win if the trade moves away from the spread, sits, or slowly rallies/rallies with a delta hedge.

4. Take the trade off for a credit: Once the trade is on, the trader should have the goal to take the trade off for a nice credit against putting it on for a credit. If executed in such a manner, the trade is likely to work out very well.

When all is said and done, the trader will have a front spread that looks like this (Figure 3).

Notice it has a credit, and is clean at expiration all the way up to 551. As long as AAPL doesn't move too quickly this 1 by 2 will be a nice winner in no time. If the stock stops in its trades, this trade could make a killing.

As you can see, a front spread can be a great trade, it can fit in a lot of situations from a high vol environment to a high skew environment. Then watch the vol and sell the curve at its most expensive points. **EM**

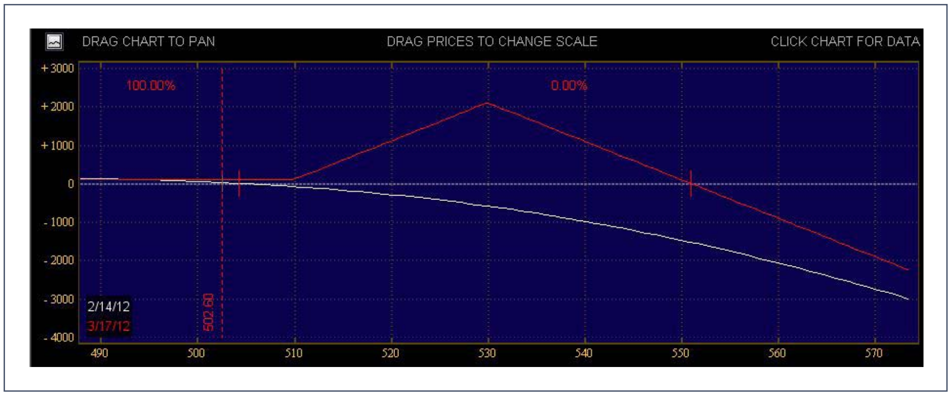
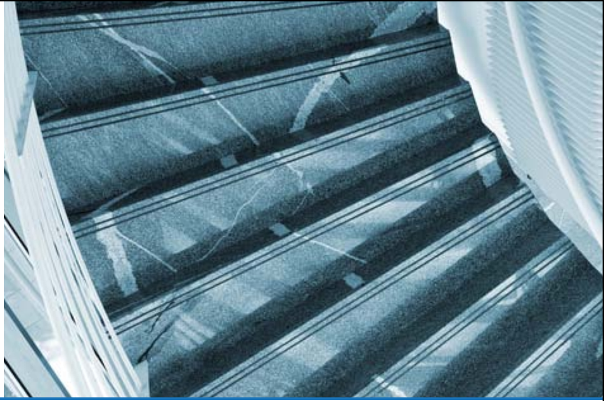


FIGURE 3



Volatility Phenomena and the Skew

Andrew Giovinazzi, Guest Contributor

What determines the bid/ask?

Options are priced in the market on an exchange. Stock options, index options, and future options all trade at prices dictated by supply and demand. Price them too low and buyers come in. Price them too high and sellers come in. But that is how a professional option trader looks at the market. The relative lowness and highness are lost on most market participants. All they want is a 10-lot of calls in AAPL and they are happy as a pig in a poke. And that is how we get the natural bid/ask in the market; liquidity providers maintaining the market and the ravenous demand for options from the public. At some point there is a market made around that number. Now, how to measure the number?

The Model Makes Assumptions

Fisher Black and Myron Scholes came up with a way to model option values based on the idea of heat moving from a hot place to a cold place. Heat decays at a fairly steady rate and that matched up nicely with how options decay as they move to expiration. Voila, a new industry was born on modeling the values of options, which changed the face of modern finance. The model makes some assumptions, one being that the underlying price change that goes into the model follows a lognormal distribution pattern. The forward value of the security assumes an even rate of return on the underlying after the cost of carry. Given a call and put strike equidistant from the underlying price, the call will always have more value than the put. Stocks can only go to zero but can go up forever. The problem with that idea is that the market wants options for insurance and income. Liquidity providers get around that by using a concept called 'skew' when pricing options.

Skew Conveniently Ignores the Model and Prices the Demand

What skew does is price the demand of calls and put relative to the at-the-money options. Markets go down faster than they go up, so puts get slightly inflated prices relative to what the theoretical model calculates. The forecast volatility number that goes into the puts get pumped up a bit. The forecast volatility number gets reduced a bit for the calls. This is the Vig liquidity providers charge for insurance/income and one of the first things I learned as a trader. Each option series has a distinct volatility number which makes the slope of the skew curve is a measurable number. Think of those little out-of-the-money puts as cheap insurance. In order to get the insurance up to a price someone is willing to sell, the only alternative is to use a higher volatility number to expand the theoretical price. That number is very much higher than the at-the-money volatility. Conversely, out-of-the-money calls are sold for income so the skew will compress the volatility number that generates the value. The slope of the volatility curve prices demand (Figure 1).

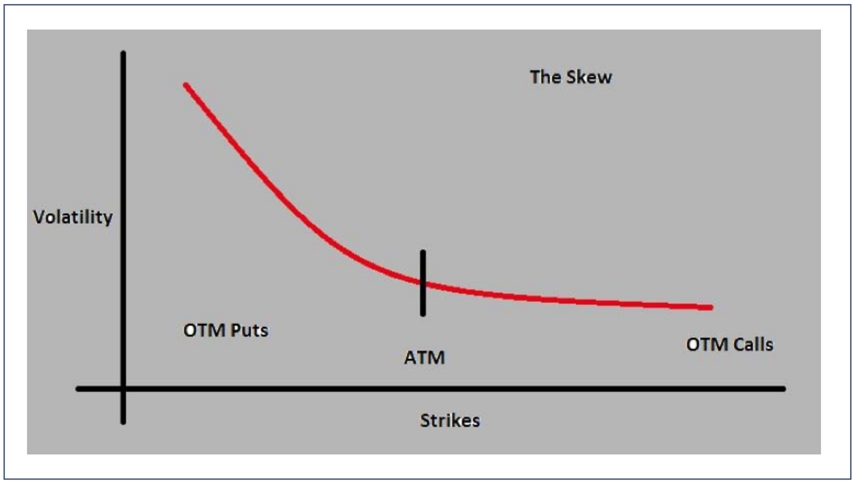


FIGURE 1

Skew Is a Separate Diagnostic Tool

Now two factors are in play, the absolute level of forecast volatility in the ATM options and slope of the volatility curves that emanate from it. The relative steepness of the curve on the downside is a way to measure the demand for puts. The relative steepness on the upside helps measure supply of calls. On any given day those values are expressed as a percentage of the ATM forecast volatility. That sounds easy enough but what happens when the underlying moves up or down? The ATM volatility will increase or decrease with a move up or down even if the demand curve for options stays the same. Move down too fast and the ATM options look expensive with no change in demand. Move up too fast and the ATM option look too cheap. In these cases the slope of the skew curve can change based on liquidity providers' conceptions of the market. When it shifts, you can get an idea of what is going on in the market that just a change in volatility might not tell you.

Skew Measures Supply and Demand More Intimately Than IV

If the market continues to climb the curve should take on lower and lower ATM strike volatilities since that is what the initial values dictated. What that does is leave lower and lower OTM put values. The liquidity provider does not like selling insurance cheap. If there is no supply of calls on the run up in the underlying, traders are force to bid up the calls to cover all the puts and underlying security they are selling to meet demand. Short puts and short underlying are just a giant synthetic short call position that needs to be fed with a steady stream of calls to balance risk. Even with market going up, the volatility is not coming down because the liquidity providers are not in balance. Call skew will actually flatten to address this to bring more sellers into the market. There are many variations on this theme of skew curve, ATM volatility, and actual volatility expectations.

Skew Has an Implied Delta

Volatility helps drive the value of an options delta since it is one of the model's inputs. Changes in volatility change the delta of an option, even with all of the other inputs being equal. This means that just a change in the underlying price can affect the delta of a position with skewed option prices even if the gamma of the position overall is flat. The relative relationship of calls and puts can change, which results in sudden and sometime abrupt changes in p/l even with the ATM volatilities staying flat. The skewness of a multi-strike position in an index or big number equity has a delta of its own.

Mind the Skew and It Will Mind You

The months of January and February have seen declines in implied volatility overall. The big principle with option volatility is that it is related to the movement in the underlying. After all, the options are trying to forecast movement. The implied volatility has stayed stubbornly above the realized volatility since at least the beginning of the year. At some point that will correct and drive the VIX down below 18 if the same pattern continues. To counteract a lower ATM volatility, the skew on the downside will remain steep until the problems of the 2nd half of 2011 are a memory (which in trader land takes about a month more). As I write this on Valentine's Day, those OTM put prices are at some of their loftiest levels versus the ATM strikes than we have seen in a while. If the market buys the rally they will eventually come in. Mind the upside skew also as a flatter curve for OTM calls means there is a lack of willing sellers. By then maybe we will all be buying the rally. EM

Option Skew and
What it Means to You

Russell Rhoads, Guest Contributor

SKEW IS ONE OF THOSE terms that is bantered about frequently in the option world without much explanation. It is a vague reference to the different levels of implied volatility that is priced into options that have the same underlying security. Skew may refer to comparing implied volatility for options that expire on the same date or even options that have different expiration. When both different expirations and different strikes are combined we get a three dimensional chart that show the surface of the skew. Today we are going to stick with taking a look at volatility on options that share an expiration date and what they may be telling us.

The chart in Figure 1 shows the implied volatility for S&P 500 index options that expire in 33 days. The S&P 500 index was quoted around 1350 when these volatility levels were captured. Note the share of this chart. It is skewed as the strike prices below the current market are plotted. This is a function of more demand for S&P 500 put options that are out of the money for portfolio protection. This shape is typical when plotting volatility of S&P 500 option contracts.

Implied volatility is function of the price of an option. When there is more demand for option contracts, or more buy orders hitting the market than sell orders, the price will increase for option contract. All else being the same, time to expiration and the underlying market price, the implied volatility as priced in by the option contract will move up as well. If there is more concern in the marketplace about a large drop in the S&P 500 over a certain period of time then there will be more demand for out of the money puts. This higher demand will change the shape of the chart that may be created plotting the volatility of S&P 500 index options.

The red line on Figure 2 shows a shift in the plot of SPX volatility that may result from increased buying of out of the money put SPX put options. With an increase in buying of these contracts comes higher implied volatility. The reason behind purchasing these contracts would be an outlook that foresees a big drop in the stock market as measured by the S&P 500 index. By watching the shape of this curve we can get an idea how concerned market participants are about a big drop in the stock market. However, plotting this shape and comparing it to past curves may be prohibitively cumbersome. The CBOE has created an index that overcomes this.

In February 2012, the CBOE S&P 500 SKEW® (SKEW) index was introduced. This index takes

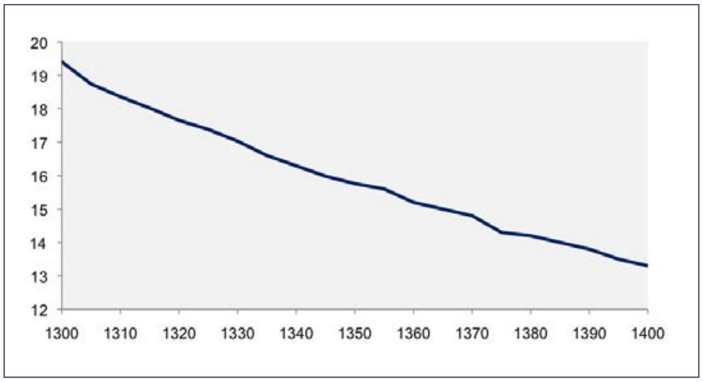


FIGURE 1

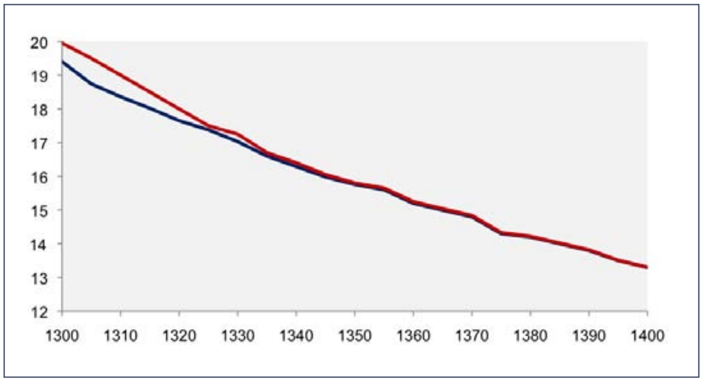


FIGURE 2

the implied volatility of SPX options and creates a linear chart that normally slopes higher from the right to left. The steeper the slope, the higher the implied volatility of out of the money puts relative to the implied volatility for put options that have a strike price closer to where the S&P 500 is being quoted. The red and blue lines on Figure 3 are a linear representation of the slope of the plot of SPX implied volatility levels.

The slope of the red line is more dramatic than that of the blue line. The SKEW index takes the slope of these lines and turns it into a quantifiable index. The formula takes the slope and converts it into an index using the following formula:

SKEW = 100 – 10 x (Slope)

Consider the slope of the blue line at -1.5. Using the formula the SKEW index would be quoted at 115 (100 – 10 x (-1.5)). The slope of the red line is -3.0 so the resulting quote for the SKEW would be 130 (100 – 10 x (-3.0)). The red line is pricing in higher implied volatility for out of the money puts. This translates to higher risk of a market move to the downside being priced in by the red line market than the blue line market.

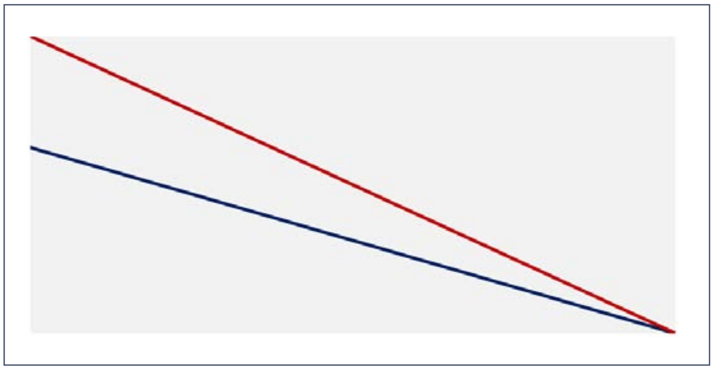


FIGURE 3

The slope is determined by comparing the implied volatility of SPX put option contracts that are three standard deviations out of the money. The demand for these contracts would rise when there is an expectation of a large market drop. According to statistical models, three standard deviation moves should occur once every few years. The demand for options that would pay off in this situation is an indication of true concern about the overall stock market.

Although the CBOE only introduced the SKEW a little over a year ago the exchange does have data going back to the January 1, 1990, for this index. Over this course of time the high of the index has been in the low 140s and the low just above 100. The average SKEW index is around 116. A SKEW of 100 would indicate market participants are not terribly concerned about a big drop in the markets as the implied volatility for out of the money puts would be equal to the volatility being priced in by at the money put option contracts.

> The SKEW index is an **excellent method** of monitoring the risk of a **market drop** that is being priced in by SPX option contracts.

The SKEW index is an excellent method of monitoring the risk of a market drop that is being priced in by SPX option contracts without having to go through the trouble of trying to plot the shape of the curve on your own. Those that would like to see how the SKEW index has done as an indication of a drop in the overall market can find the historical data and all needed information at www.cboe.com/skew. EM

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*

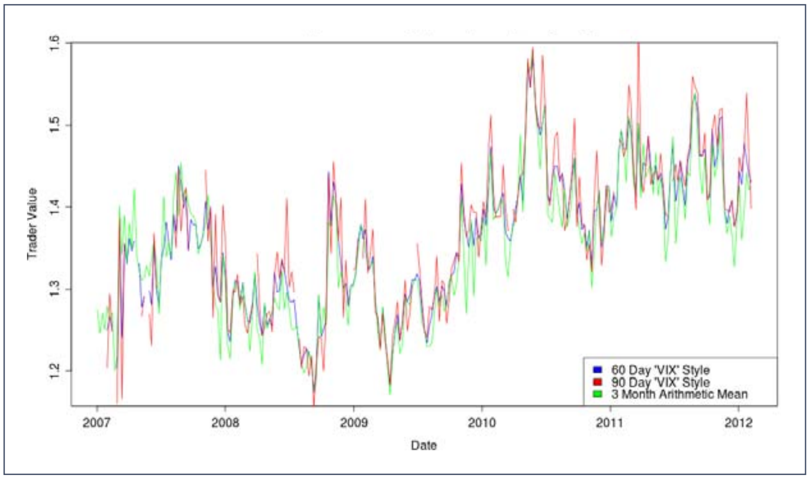


FIGURE 3 *Trader Algorithm: Average, 60-Day, 90-Day Weightings*

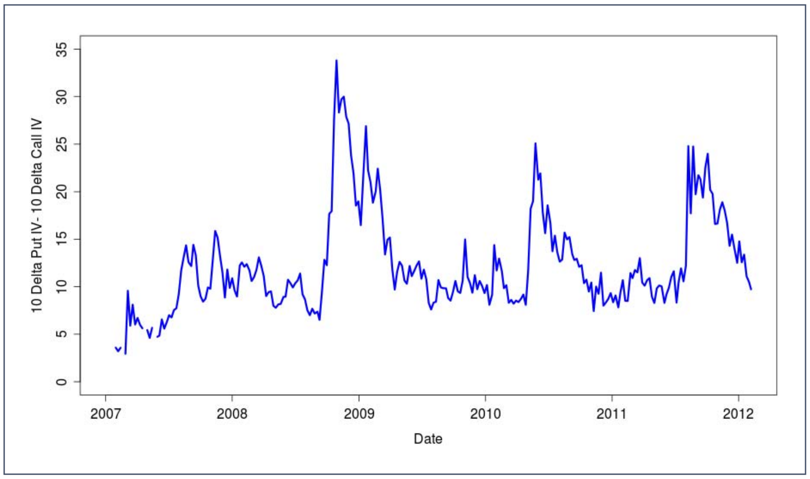


FIGURE 4 *10-Delta Implied Volatility (Put-Call): 60-Day Distance Weighted Estimator*

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

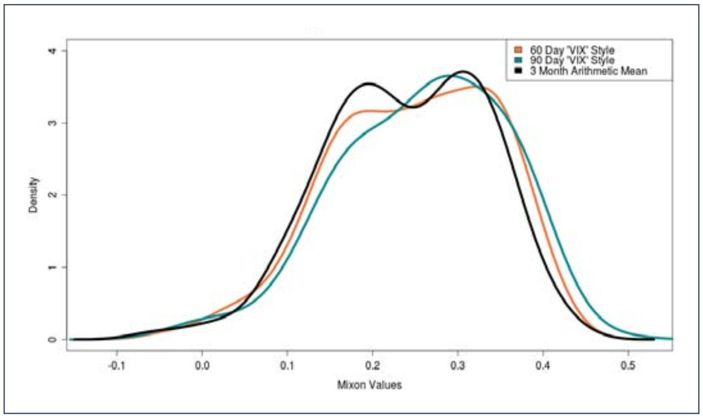


FIGURE 5 *Density Smoothed Mixon Values*

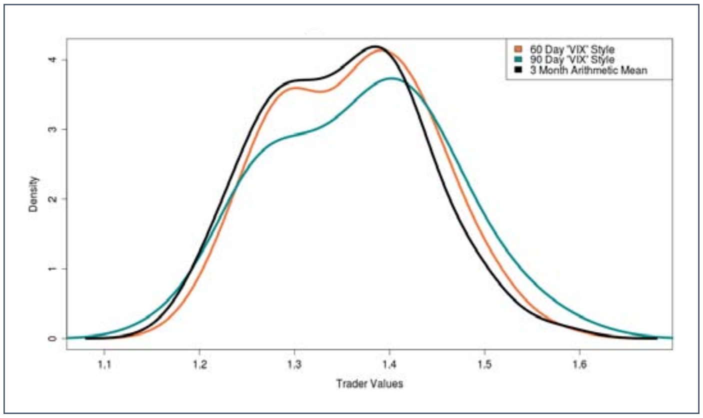


FIGURE 6 *Density Smoothed Trader Values*

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*

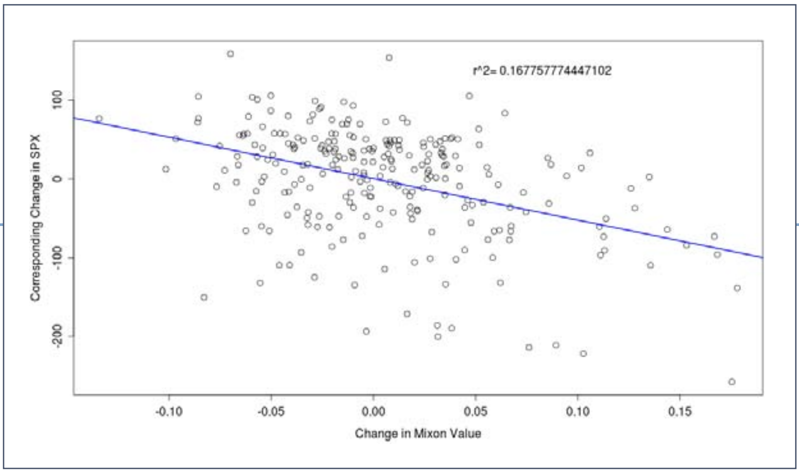


FIGURE 9 *4-Week Mixon Change (60d) | 4-Week Change in SPX*

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

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Sebastian, Mark. "Using Skew to Trade Direction." *Expiring Monthly,* April 2010.

Meizinger, Steve. "Trading With or Against Skew." *Expiring Monthly,* April 2010.

McCarty, Michael. "A Multi-Dimensional Look at Implied Volatility." *Expiring Monthly,* March 2011.

Giovinazzi, Andrew. "Is There Such a Thing as Gravity in Implied Volatility?" *Expiring Monthly,* November 2011.

Using Skew to Trade a Backspread

Mark Sebastian

IN SETTING UP a backspread, there should be a few things a trader looks for:

1. Generally low volatility
2. A flat skew
3. A reason to think the IV is going to rally in the very near future

During the week of February 10th, ahead of the Greek vote, we saw some very interesting reasons to enter a backspread. For starters the VIX itself was low.

LiveVol

FIGURE 1

On its own that can be a good reason to do all sorts of plays both long and short. In fact, when the VIX is low is often when IV is *most* overpriced. Before a trade can be entered more work needs to be done. Researching further the CBOE SKEW index (a proxy in this case for how I track put skew) was also relatively inexpensive, especially in conjunction with a low VIX.

thinkorswim

FIGURE 2

So we hit our requirements for relatively low IV and flat skew. But is there a reason for a trader to think that IV could rally? The answer is yes, as Bill Luby stated in his blog, one precursor to a vol pop and be a break in correlation of 'coupling' of VIX and the SPX. We also saw VIX futures rallying with the market.

We have now hit all three of our requirements for a backspread. On Wednesday, Feb 8, toward the end of the day we decide to enter a backspread. Generally speaking, I like to set up backspreads where I am collecting a small credit (typically the least I can possibly collect while still collecting). I also like to give the trade enough time to work.

In this case we enter the 1350/1300 1 by 2 backspread in March.

Figures 3–7: OptionVue 6

Options	MAR <37>					
1340 calls	MktPr	MIV	Trade	Ex.Pos	Vega	Delta
1350 puts>	28.20	15.1%	-5		171	-51.6
1340 puts	24.10	15.7%			170	-45.6
1330 puts	20.80	16.5%			166	-40.0
1320 puts	17.50	16.9%			159	-34.9
1310 puts	15.10	17.5%			150	-30.3
1300 puts	13.00	18.2%	+10		140	-26.1

FIGURE 3

The trade receives a small net credit on 2 options that are relatively close to ATM for SPX, this is very favorable.

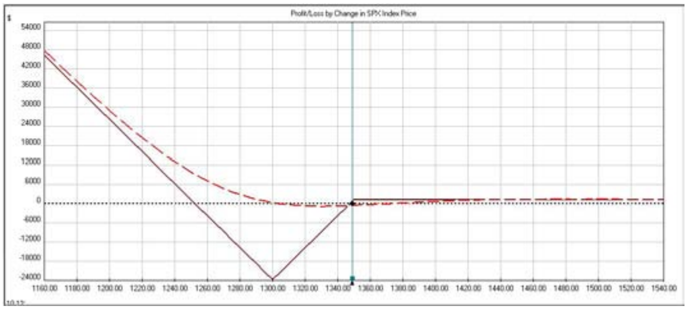


FIGURE 4

The next day, as you can see in the VIX and Skew chart, our trade is already a small winner, although not near what we are looking for.

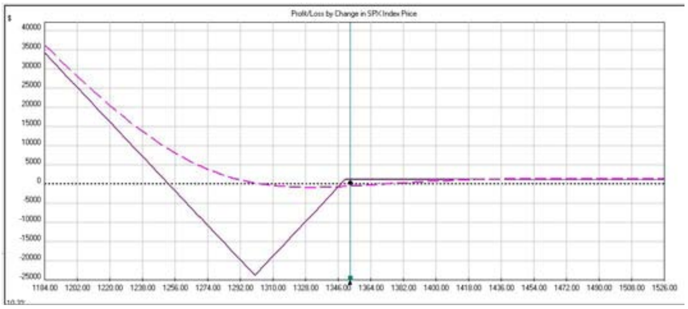


FIGURE 5

Then, on Friday, the 10th, there is what amounts to somewhat of a panic in volatility. The market sells off small, less than 1%, but the VIX explodes and SKEW explodes at the same time. On little to no movement our trade is now making a nice profit.

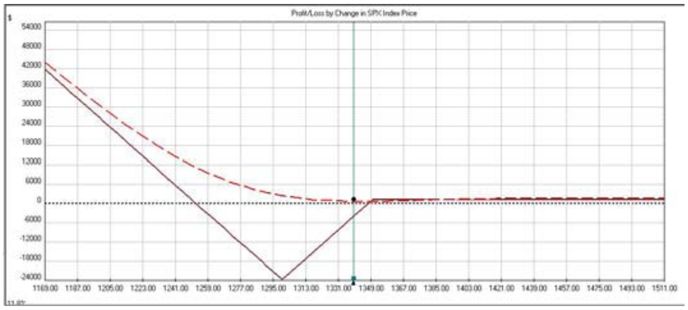


FIGURE 6

Up about 1300 dollars in 2 days on a 5 by 10 lot, heading into a weekend where, if the Greeks get their act together the trade will get slammed. The trade is probably a smart close. One of the important things about backspreads is that it is important to try and win as quickly as possible. Backspreads, especially in indexes, have a short lifespan. If you are in a spread and it wins, exit.

Cash Flow	+$1,135	Delta	-35.00
Cur. Value	+$185	Gamma	1.54
Gain/Loss	+$1,320	Theta	-233.2
Commis	$15.00	Vega	654.6

FIGURE 7

As we stated, up almost 1500.00 on a 5 lot (you count backspreads by the 1, not the 2) we take the money and run. On Monday, if the market is down big, we will be kicking ourselves, but if it's *up* huge and IV collapses, we will be very happy.

This trade can also be used as a great hedge against a portfolio of short premium spreads, especially in 'oversold' environments. EM

Calculating the Future
Range of the VIX

Bill Luby

GUESSING WHERE the CBOE Volatility Index, better known as the VIX, will be in a month or two or more has never been an easy game, but it seems to have to have become even more difficult over the course of the past two years, as investors have grappled with what the 'new normal' should be for volatility in a post-Flash Crash world, where the future of the euro zone and the Chinese real estate market—not to mention a host of other factors—have greatly complicated the task of anticipating future market volatility.

There are some tools that make it easier to get a handle on what the market consensus is regarding future volatility—and one of the most overlooked is the CBOE S&P 500 3-Month Volatility Index (VXV), which is essentially a 93-day version of the VIX, which looks out only 30 days into the future. A more thorough set of market-based data can be found in the form of the VIX futures, which generally reflect the consensus opinion of where the cash VIX (the widely quoted index) will be anywhere from one to nine months into the future.

This article will examine historical cash VIX data in order to provide a framework for assessing the potential future range of the VIX. Along the way, I will attempt to address some questions about the shape of the VIX futures term structure and point to areas for potential future research topics.

VIX Index vs. Futures Historical Data

The VIX index was originally launched in 1993, with a slightly different calculation than the one that is currently employed. The 'original VIX' (which is still tracked under the ticker VXO) differs from the current VIX in two main respects: it is based on the S&P 100 (OEX) instead of the S&P 500; and it targets at-the-money options instead of the broad range of strikes utilized by the VIX. The current VIX was reformulated on September 22, 2003, at which time the original VIX was assigned the VXO ticker.

Following the launch of the current VIX calculation methodology in 2003, the CBOE reconstructed end-of-day (EOD) VIX data going back to the beginning of 1990 and intraday (open, high, low and close) data for the VIX starting at the beginning of 1992.

From a research perspective, this means there are 22 years of EOD VIX index data and 20 years of intraday VIX data. For the sake of comparison, the VIX futures date from 2004, but initially included just one or two consecutive months. It was not until October 2006 that at least five consecutive contract months were listed. The result is a little over five years of workable, VIX EOD futures data. For this reason, the research cited below draws upon CBOE VIX index data going back to 1990, *not* the historical futures data.

> If 22 years of history is any guide, then in any random 21-day forward window, the **maximum VIX value** will be on average (mean) a little over 24.00, with a median value of just under 22.00.

Research Methodology and the Cash VIX Look-ahead Window

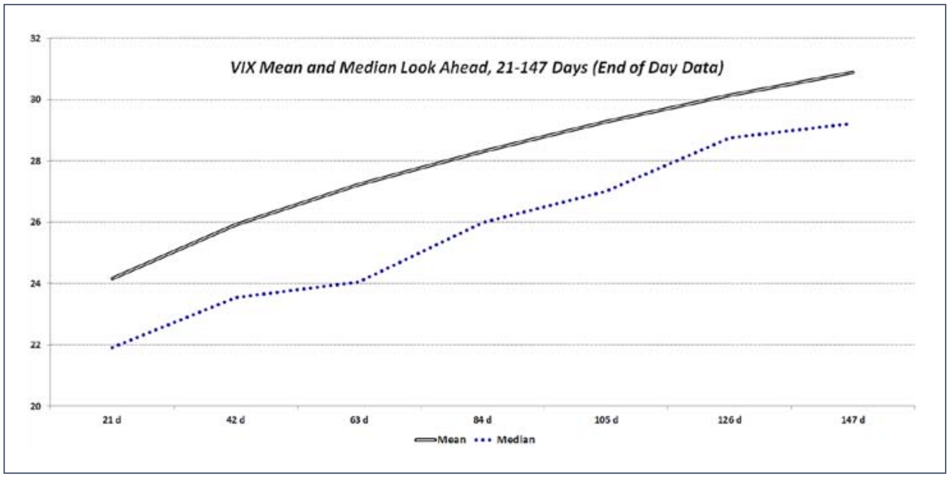
While it is often dangerous to assume that future data will resemble past data, it certainly helps to understand the details of historical data.

For this reason, I examined the full set of EOD and intraday cash VIX data and calculated the maximum future VIX value in each series for seven forward-looking windows that approximate the first seven months of VIX futures, assuming 21 trading days per cycle: 21 days; 42 days; 63 days; 84 days; 105 days; 126 days; and 147 days. For each look-ahead window, I also sought to get a sense of the distribution of maximum VIX values by capturing the values associated with the 99th, 98th, 95th, 90th, 80th, 50th, 20th, 10th, 5th, 2nd and 1st percentile of the data set, as well as the minimum value (in this case the minimum of the maximum VIX levels) in the series. To get a sense of some additional central tendencies, I also calculated the mean maximum VIX.

It turns out that the EOD and intraday VIX data yield very similar results, with the intraday maximum VIX data exceeding the EOD data by about 6.5% across the full range of future time horizons. As a result and because the EOD data add two years to the data set, the data below are limited to end-of-day cash VIX data.

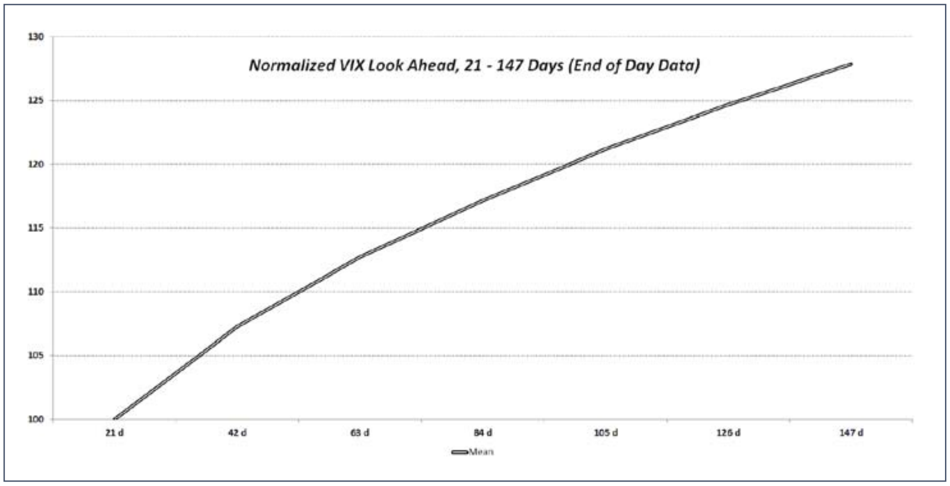
The Future Maximum VIX as Seen in the Look-ahead Window

If 22 years of history is any guide, then in any random 21-day forward window, the maximum VIX value will be on average (mean) a little over 24.00, with a median value of just under 22.00. Each additional 21-day window out through 126 days (approximately six months) adds another 1.3 points or so to both the mean and median expected maximum VIX. The result is a mean expected maximum VIX of just over 30.00 for the 126-day look-ahead window and a median expected maximum VIX of just under 29.00 for the same period. After 126 days, the relatively linear increase in the expected maximum future VIX begins to plateau. Figure 1 below captures the mean and median expectations for the maximum VIX for 21 through 147 days.



CBOE, VIX and More

FIGURE 1 *VIX Mean and Median Look-ahead, 21–147 Days*



CBOE, VIX and More

FIGURE 2 *Normalized VIX Look-ahead, 21–147 Days*

A normalized version of the mean expected maximum future VIX shows that when the 21-day look-ahead period is assigned a value of 100, the incremental expectation for each 21-day period defines an arc that flattens a little each month, with the first incremental 21-day look-ahead promising a 7.3% gain in the maximum expected VIX, while the last incremental look-ahead period (from 126 to 147 days) promises a maximum VIX that is only 2.5% higher. Figure 2 details the flattening of the normalized future maximum VIX curve. Note that this type of curve bears a strong resemblance to the typical VIX futures term structure curve, which often exhibits signs of flattening during the fourth to seventh month.

Last but not least, Figure 3 shows the future maximum expected VIX values for the 21-day, 63-day, 105-day and 147-day look-ahead windows, with the VIX on the Y-axis and the percentile on the X-axis. To interpret the data, consider that for the 21-day look-ahead (solid blue line), the median (50th percentile) future maximum expected VIX is just below 22.00 and jumps above 30.00 at the 80th percentile and above 35.00 at the 90th percentile, hits 45.00 at the 95th percentile, etc. The 147-day look (dashed red line) ahead anticipates a future maximum expected VIX of 42.00 at the 80th percentile, 46.00 at the 90th percentile, 48.00 at the 95th percentile, and tops out at 80.86 at for 98th percentile and above.

Conclusion

For those who trading VIX futures and options, knowledge about the historical ranges of the VIX index can be invaluable in estimating the probabilities associated with future VIX moves, constructing a viable risk management plan and related considerations.

The above data should help provide a statistical framework for some of those calculations and may hopefully inspire some traders to undertake their own related research projects.

Of course there are risks involved in extrapolating from historical data to expectations about what the future might look like. Anyone who undertook the exercise above in 2007 would certainly have very different expectations about the nature of the future range of the VIX and would likely have greatly underestimated the magnitude of the VIX spikes in 2008, 2010 and 2011.

To a large extent, the forward-looking "maximum VIX" calculations reflect the nature of the crises the financial markets have endured during the past 22 years and may be much more volatile—or less volatile—than what the future turns out to be. That being said, there is considerable value in knowing what the mean, median, 80th, 90th and 95th percentile of maximum VIX readings have been over the last 22 years, as these

continued on page 33

CBOE, VIX and More

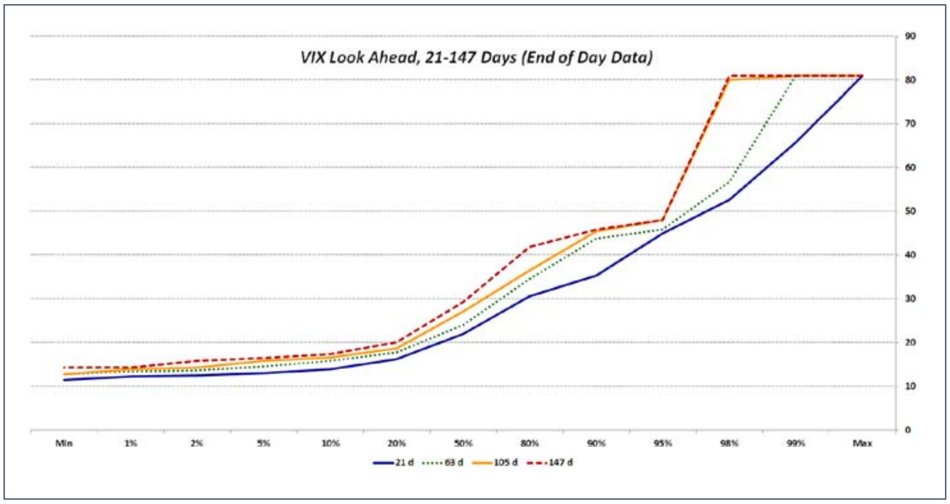


FIGURE 3 *VIX Look-ahead, 21–147 Days*

Expiring Monthly Interview with

Henry Schwartz

Mark Sebastian

Henry is the president of Trade Alert LLC, a provider of real-time options analysis tools to leading Wall Street firms. His systems analyze hundreds of thousands of transactions per second to help professionals identify and interpret market activity in real time, supporting informed trading decisions and intelligent idea generation. He has held institutional trading and management roles with Bank of America, Bear Stearns, Salomon Brothers and the Hull Group, and made markets on the CBOE and AMEX floors in the US, and EUREX and MONEP overseas. Prior to founding Trade Alert, he led the electronic market-making group at Bank of America coincident with the launch of the International Securities Exchange.

Expiring Monthly: *Please describe Trade Alert and WhatsTrading.com.*

Henry Schwartz: Trade Alert is the firm I started after leaving the Bank of America trading desk in 2004. We provide options data and order flow analysis tools to equity derivatives professionals including institutional salespeople and traders, market makers, floor brokers and financial reporters. Whatstrading.com is a site we launched a few years later to deliver option flow analysis to retail and semi-pro traders.

EM: *What caused you to get into this business?*

HS: I started out as a market maker in the early 90s with a strictly mathematical view of the market. I could trade thousands of contracts per day without any opinions at all about the products I was trading, in fact judgement calls and predictions were discouraged in my firm and were not necessary to make money. But when I moved to the institutional side of the business I found that a trader's view (whether right or wrong) was an important part of the customer experience, and so I started putting more work into looking at order flow as a source of intelligence for trading ideas and client discussions.

EM: *Why do customers care about order flow?*

HS: Options are used by the most sophisticated and highly capitalized firms to make very specific bets about the future. These firms put a great deal of resources into their decisions, and observation of what they are doing—from time-sensitive directional bets to implied volatility trades to dividend and interest rate plays is an important piece of the universe of information that traders need to consider to make decisions. Basic competition for investor dollars and profitable ideas means we all care about what 'the other guy' is doing. In addition to anecdotal cases of flow tipping off impending moves, academic research has confirmed that information is there, the trick is cutting through the noise to see it.

EM: *What are a few ways traders can use order flow to improve trading?*

HS: It takes a very compelling reason to make a trade. Capital is scarce, risk is stressful, and there are significant costs to get in or out of a position. So when I see a large trade or flow that looks out of line with the typical baseline activity in a stock, it's worth considering what this trader might be thinking and how I might be able to profit (or avoid getting run over!) from their homework.

EM: *How can flow be misleading?*

HS: It's important to understand that the visible option flow seen in the listed market is often connected to other, possibly larger, parts of a transaction and so there is a chance that the motivation behind the trade is not at all what it appears. Consider a simple collar trade—paper that is buying puts and selling calls is often considered a bearish sign, but if the flow is simply part of a recurring collar strategy on a core stock position it's really not bearish at all, in fact it's bullish because the hedged stock position is unlikely to get dumped into a downturn.

EM: *What are a few things every trader needs to understand about reading order flow?*

HS: First of all you need specialized tools to crunch the massive amounts of data coming out of the options market. I believe ours are best because it's all we do, but a few other vendors have added some flow analysis features to their offerings as well. Second, you need to consider every possible reason that could be behind a trade (did the buyer lift the call offer for directional leverage or were they interested in accumulating what they believe to be 'cheap' vega?) And third, it's important to keep things in perspective and realize that flow analysis is important but it takes strategy and understanding to turn ideas into profitable trades.

EM: *As order flow becomes more available, how does this affect the market maker? With penny pricing and orders becoming more open, what advantage is there to being a market maker?*

HS: The US option market has seen consistent growth over the past decade, even while underlying stock volume dipped last year. While volume growth is great for market-makers, more efficient markets are not, and that's what we've seen happen recently. Intense competition between exchanges, better technology, and initiatives like penny pricing and dollar strikes have led to the tightest markets and lowest costs customers have ever seen—and that's boosted volume, but tighter bid-ask spreads and the technical challenges of competing in today's markets has meant that market makers have had to adapt or exit the business. Plenty have disappeared, and the remaining firms tend to be very large, with economies of scale and a significant budget for ongoing technology development. One source told me the annual IT spend for a top tier market-maker starts at $20 million.

EM: *Getting to the exchanges: What are your thoughts on PFOF, how has it affected order routing?*

HS: Payment for flow, maker-taker fee structures, and assorted other initiatives are simply attempts to solidify relationships between counterparties in today's fragmented and automated markets. In the olden days everyone knew where to direct orders for best execution, even for multi-listed products, and there was a type of 'loyalty' between trading pits and the upstairs brokers. But today the decision is much more complex because markets are generally anonymous, liquidity is divided among exchanges, and each of the nine trading venues works differently. I was involved in PFOF decisions when I ran BofA's PMM at the ISE, and I don't think its a great way to do business — some brokers would refuse payment on principle, and other brokers required PFOF just to stay in business. In the end, I believe that maker-taker pricing is a bit more transparent and you don't end up with 'smart paper' trying to sneak into a supposedly retail pipe, but then you do run into issues of 'unequal $1 offers' and some gaming of quotes to capture rebates, both can be very confusing for customers.

EM: *What is next for the exchanges? There seem to be MT exchanges popping up everywhere, can the traditional PFOF model last?*

HS: PFOF is a tax on market-makers, with proceeds used to incent order flow originators for their volume. This assumes that selected flow provider (like Schwab, Etrade or Fidelity) will bring relatively 'dumb' order flow to the market-makers who will be able to realize profit. I don't think that assumption will hold true for the long term. MT is a tax on any participant that takes liquidity out of the market, and a credit to anyone adding liquidity by posting a resting bid or offer. In my mind MT makes more sense and while complicated by different schemes each exchange, it's still transparent. I believe one of the next exchanges starting up is looking to go back to flat fee pricing, and while the simplicity of that model is great, they will have a tough time attracting the large part of the order flow that goes where costs are most advantageous.

EM: *What do you think could be the next major change in trading over the next few years?*

HS: I think we hit a few interesting peaks recently. Option volume as a function of underlying volume, concentration of flow among top products, and the use of ETF options rather than individual stock options — I expect all of these to trend lower, so we will need to see stock volumes recover to continue to see option volume growth. Concentration of volume is also a bit out of hand — forget about the 80/20 rule, today the top 10 listed products (out of 3700!) account for 35% of the daily volume. That's a problem because liquidity in the other 3690 listings suffers as a result. The success of the weeklys is impressive — some days 20% of the US flow is weekly options, and most days 40% of AAPL flow is weekly — so I expect we'll see daily options later this year, at least on a few of the busiest names and during earnings periods etc. But

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Training Traders

Andrew Giovinazzi, Guest Contributor

AS A FLOOR TRADER working for a good size prop trading firm I had two jobs. One was trading for the group account and the second was teaching trainees how to trade. Yes, our trading firm took raw recruits out of college and turned them into option trading machines. This is a short story of how we did it and what we had to do to achieve results. Actually there was a fair amount of debate on this subject early on in the firm. The debate being should we hire existing traders and give them better rates, capital and technology, or grow our own. The debate was solved rather quickly, actually.

This was around mid-1990 and the market was just coming into a severe swoon with the impending Gulf War and the slow unraveling of the S&L (for those scoring at home there is a crisis per decade) put selling store (aka crisis) run by the government. The Feds still have not learned to sell puts for free (read Fannie and Freddie) but that is for another story. Soon after, some of the traders our company hired started strapping on large positions. In and of itself a large position is not a terrible thing in a liquid stock. The problem some traders run into is when they cross the line from being a market maker to the market. There is no blinking light that goes off when a position is so big it consumes the market. What you get is an untradable position. There is not enough liquidity to cover the short contracts and there is not enough liquidity in the underlying to manage the long contract. This was one of my first lessons in risk management as a clerk: Always be able to make another trade. If the trader cannot add on the same side of the market, the position is too big. Our firm trader had gotten too big and now the partners, looking at their capital, decided it was time to trim the position even if it meant a loss. To their surprise they had trouble enforcing the position adjustment (known as unwinding) as the trader did not want to take a loss and disrupt a potential bonus. What to do, what to do? They went to Chicago and fired the trader. At some point, firm health takes priority and now was the time. The relative illiquidity in the market conditions did not leave a big choice.

This episode solved the debate. It is far easier to grow a trader with risk controls and no real bad habits than hiring one with a raft of bad habits and no respect for a risk desk. So the partners decided to grow their own talent and timing was pretty good, right at the bottom of the market. I began teaching trainees (FNGs) in Chicago in early 1992, about a year after I started trading myself. Now the fun starts. Running the trading program in Chicago on the floor of the CBOE had lots of perks. Clerks get coffee, run sheets, pick up paper and any menial task you can think of. They even had my car washed and changed light bulbs in my flat. In return for this feudal servitude we taught our trainees how to survive and thrive in one of the most hostile business environments on earth. How did we train 70 or so traders how to make it? It is really a combination of fundamentals and psychology.

The fundamentals of options are relatively easy with a rudimentary understanding of high school math and statistics. Trading options is very teachable if the subject takes the time to learn. It is like any other profession that way. Clerks on a trading floor were breathing options eight hours per day minimum. They could see the fundamentals in action and part of the training we instituted was having a trainee shadow a trader. Nothing like firsthand experience and in this environment, speed and accuracy were key. Many trainees never made it past this point because they could not execute under pressure. How to weed out the ones that did?

This is where things got a bit gritty. We hazed them. For me I needed to see where the character strengths and weaknesses were. I had to poke their brains and put the trainees in hopeless situations. One example is we made them go looking around the floor for an 'uptick box' so our stock desk could execute sales. No Uptick Box, no stock trading, and we needed it by the open. Of course there is no Uptick Box but someone with no experience does not know that. After 30 minutes of looking, the smart ones realized that no box existed, but they were had anyway. Some did not give up and would check every clearing firm in the CBOE tower. This was most likely the first failure of their short lives but all I wanted was survival. Trading is really just making decisions and adjusting if necessary. The mock trading sessions were worse as we fired continual orders and market requests at them always asking for more than it was possible to deliver. I even needed to put a table between myself and the trainees as the competition for order flow would nearly come to blows. Perfect! The training environment was harder than the trading environment and that is what worked. Our company went to the extent of training on each exchange and then bringing the best candidates together to compete. Trading looked like fun after that and traders got to spend the money they made. But that, of course, is a different story. EM

A VIX-Based Argument for an SEC/CFTC Merger

Jared Woodard

ALL THE SMART PEOPLE favor a merger of Securities and Exchange Commission and the Commodity Futures Trading Commission. Here is a pedestrian example why the regulatory, product-based separation is groundless. If you buy a call option on USO, the popular crude oil ETF, that transaction is under the purview of the SEC, since USO is a security. If you buy a call option on the CME WTI crude oil futures contract, that transaction is under the purview of the CFTC, since CL futures are futures. But the performance of those two contracts in percentage terms could very easily turn out to be identical. The asset that conceptually underlies those options—a physical barrel of crude oil—is the same. The purpose of the transactions is the same (assuming you don't intend to take delivery of the oil, which no one does.) If we assume that the cost to investors and to society of regulating twice what could be regulated once is non-zero, then presumption is on the side of the party demanding to know why the agencies should be separate. I can't think of a good reason, and I haven't read one in any forum.

The situation where VIX products are concerned is particularly frustrating. When discussing VIX options with newer traders, Bill, Mark, and I inevitably point out that the underlying for VIX options is not the popular VIX spot index. Usually, we say that the underlying is the VIX futures. Practically speaking, that is true—the options mirror changes in VIX futures just like SPY options mirror changes in the SPY ETF. Technically, however, there is no tradable underlying asset for VIX options. The underlying for VIX options is a calculation of VIX forward value. Here's the CBOE's explanation (from here):

> "The underlying for VIX options is the expected, or forward, value of VIX at expiration, rather than the current, or "spot" VIX value. This forward value is estimated using the price quotations of SPX options that will be used to calculate the exercise settlement value for VIX on the expiration date, and not the options used to calculate spot VIX. For example, VIX options expiring in May 2006 will be based on SPX options expiring 30 days later—i.e. June 2006 SPX series. In fact, June SPX options do not even enter into the spot VIX calculation until April 17, 2006. Some VIX options investors look at the prices of the VIX futures to gain a better general idea of how the market is estimating the forward value of VIX."

What this means is that, because of an arbitrary regulatory barrier, we have a series of extremely popular, extremely liquid, and economically very valuable assets that should have an official relationship of underlying to derivative but instead are, as far as the regulatory agencies are concerned, completely separate and unrelated. VIX futures are actively traded and are now indispensable for many market participants, but there are no options on VIX futures to aid hedgers and speculators in gaining more precise exposure. (Yes, there are weekly VIX futures options, which have tragically gone unsupported and will, barring a major reversal of fortune, die the delisting death. Wide bid/offer spreads, shallow markets, and no marketing or education does not a successful product make.) VIX options are actively traded are now indispensable for many market participants, but there is no asset underlying those options to aid hedgers and speculators in gaining more precise exposure. If you have a securities account, you can trade VIX options but not the futures. If you have a futures account, you can trade VIX futures but not the options. The same barrier exists for equity-focused hedge funds and for CTAs. The answer to this complaint—why not just have everybody jump through both sets of regulatory hoops?—is itself a *reductio ad absurdum* of the situation. Why not then create a third regulator to oversee OTC derivatives and all products beginning with the letter "q"? The rationale can't be any less arbitrary than lame excuses about the history of agriculture in the midwest supposedly justifying today's CFTC. Why not create a meta-regulator to oversee them all, and require everyone to register with that commission as well while reciting the Options Disclosure Document from memory?

Perhaps the biggest beneficiaries of this needless administrative obstruction are the ETN providers, who make significant profits by offering a bridge between the futures and securities worlds. What is VXX, after all, except a portal for traders stuck inside securities accounts to gain some access to VIX futures? You can think of the annual management fees charged to holders of VXX (and XIV, and all the other volatility ETNs) as a tax imposed on investors to fund the regulatory and administrative blockade. I'm sure that if we totaled the annual fees earned by ETN providers for volatility products, and determined what percentage of those fees were paid in federal taxes, and what portion of those taxes funded CFTC and SEC operations that the amount would be tiny. That's hardly the point. Volatility ETN investors are smart—they are the investors who want to hedge and reduce their portfolio risk, precisely the sorts of investors society should try to foster. We should not be putting more obstacles in their way.

> **VIX futures and options love each other very much; why, then, are we keeping them apart?**

This probably sounds like a libertarian rant against government interference. In fact, the SEC and CFTC have been deliberately starved by Congress—primarily by the GOP—for decades. The agencies have been caught in an impossible trap. If these underfunded, understaffed, perpetually maligned agencies somehow succeed in their efforts to keep financial markets from devouring the intestines of our children, then Congress can exclaim that no increase in funds must ever be needed. If, as Congress intends, the agencies do the best they can with very little but somehow still let the MF Globals and Bernie Madoffs and Lehman Brothers-types elude detection until it is too late; or, worse, if the agencies are infiltrated by ex-Wall Street denizens whose ideology is to turn those agencies into ornamental effluvia; well, then, obviously the SEC and CFTC must be colossal failures demonstrating the uselessness of all government and the preferability of *laissez-faire* free market fundamentalism. In other words, I am a huge fan of these agencies when they are given enough staff and enough resources to function as intended—and since a merged agency could spend less time on turf battles and *ad hoc* rule-making, a merger would actually increase their effectiveness.

But throwing up meaningless and counterproductive walls between investing products helps no one. The people at the SEC and CFTC who genuinely want to keep markets stable and investors safe have more in common than not: why not let them work together? VIX futures and options love each other very much; why, then, are we keeping them apart? Happy Valentine's Day. EM

Calculating the Future Range of the VIX *(continued from page 25)*

statistical expectations are more likely to hold up going forward than some of the more extreme readings.

The research presented above raises at least as many questions as it answers. Future studies may wish to compare look-ahead data with VIX futures term structure data; perhaps attempt to find an explanation for the persistent contango in VIX futures; re-examine the look-ahead data under various volatility regimes, in the context of crisis environments, during bull and bear markets, etc. **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.

"Volatility During Crises." *Expiring Monthly,* August 2011.

Interview with Henry Schwartz *(continued from page 28)*

the problem with those short term options is that it's not really 'new players' so much as the same base of customers doing more trading. The industry desperately needs to pull in some new participants and I know that efforts are being made to find the next generation of options traders. I do think we'll have a few exchanges consolidate or shut down later this year, and I also think we'll see more cross-asset types of products succeed—things like GLD, TLT, and EEM—that let investors respond to global events as easily as possible. That's what traders respond to and that's how we got to where the market is today. **EM**