

A New Look at Exchange Traded Volatility Products

Since the launch of the original CBOE® volatility index in 1993 and the early volatility linked exchange traded notes in 2009, investors and traders have been increasing their use of volatility based products. More than 30 volatility exchange traded funds and notes (“ETFs” and “ETNs” respectively) have been launched, and the overall size of the ETF and ETN volatility marketplace exceeds \$3.4 billion in positions outstanding.

Prior to 2009, access to volatility-linked positions was generally limited to professional traders at large institutions. Today, there is an array of exchange traded notes (“ETNs”) and exchange traded funds (“ETFs”) through which investors and traders can access a volatility based position.

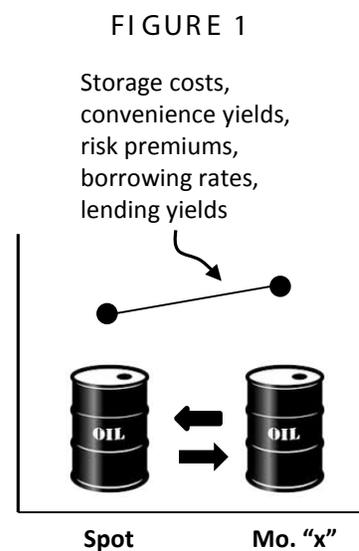
Increased attention from the media, strategists, and researchers have caused many to brand volatility, and the VIX® specifically, a separate asset class – an asset class which demands consideration in many portfolio allocations similar to equities, rates, and commodities. Greater demand and greater access to the volatility markets has not necessarily simplified volatility trading. Many active traders and investors continue to find the volatility market more idiosyncratic than other markets, which may suggest that the principles underlying volatility differ from the principles guiding more conventional asset classes.

The presence of conventional-looking features in the volatility market such as spot levels and futures markets make it tempting to apply wide ranging analogies and parallels between volatility and other asset classes – however, unlike most other asset classes, volatility may be more like a collection of separately and loosely related sub-markets rather than a single market.

Does Volatility Lend Itself to the Same Product Design as Other Asset Classes?

The markets for equities, debt, and commodities share the property that a stock, a bond, and a barrel of oil are all relatively fungible across time – that is, once one accounts for factors such as dividends, coupons, risk premiums, and storage costs, a share of stock or barrel of oil bought or sold today is reasonably translatable or convertible into the same share of stock or barrel of oil transacted in a forward market (see Figure 1 at right).

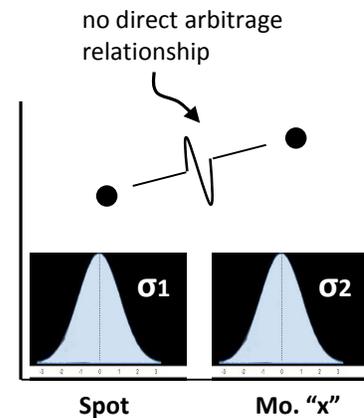
In contrast, volatility in different tenors or different timeframes (e.g. spot VIX versus VIX futures) typically have no direct and simple linkage – volatility underlying an index or contract is temporal and generally linked to a specific 30-day period now or in the future (see Figure 2 on next page). The “temporal specificity” of a particular volatility value is more like rainfall or temperatures within a specific month, and less like XYZ Co. stock



which can be bought or sold spot or 30 days forward. While some of the largest options dealers may use different combinations of over-the-counter derivatives to bridge (and arbitrage) volatility across periods, these arbitrages are less precise and less reliable than arbitrages for other financial instruments.

Some volatility ETNs and ETFs have directly adopted commodity market analysis and commodity market techniques such as curve strategies and roll optimizations. However, if the market for volatility is fundamentally different from the markets for commodities, “copied” techniques or strategies may have misguided underpinnings. While an ETN or ETF deploying a “copied” strategy may back-test adequately, the theory underlying its long-run strategy probably deserves a second look and continued reexamination.

FIGURE 2



What is the VIX and Why Should I Care?

Not every investor should trade volatility and many portfolios will do fine without the addition of a volatility-linked ETN or ETF. However, it is reasonable to assume that investors and traders may benefit from being generally familiar with equity index volatility and the VIX specifically.

The VIX (or more formally the CBOE® Volatility Index) is a value reported by the CBOE throughout each trading day, and it is based on a weighted average volatility measure of quoted S&P 500® (SPX) index options. The current (post-2003) VIX is based on weighting the prices of SPX put and call options over a wide range of strike prices where the options used in the calculation are drawn from both current-term and next-term expirations, weighted in a specific manner to approximate a 30-day expiry. The resultant value of the VIX calculation process seeks to estimate a generalized implied volatility of the S&P 500® index including the effects and impacts from lower strike put protection buying. The CBOE’s website contains detail on the VIX market and technical details relating to the VIX calculations (www.cboe.com/micro/VIX).

Implied volatility, in the most basic terms, is an input to an option trader’s model and it represents a standardized measure of expected variability expressed on an annualized basis in a unit of one standard deviation. Recall from general statistics (and the standardized Z-score table) that approximately 2 standard deviations reflect a 95% confidence level when measuring uncertain future values, and that approximately 2.5 standard deviations reflect a 99% confidence level when measuring uncertain future values (assuming well behaved data consistent with normal distributions). Using the VIX value, the current SPX level, and these Z-score multipliers, one can roughly estimate the market’s expected high and low price levels for the next year. If the VIX is 15, and the level of the SPX is 1800, annual low and



high bands (at a 95% confidence level) and using the VIX as a measure of expected realized variability can be estimated as 1260 and 2340 respectively [in each instance 1800 "+" and "-" the product of 2, 0.15, and 1800]. Similarly, the annualized volatility number can be converted into a monthly number by dividing the VIX by $\sqrt{12}$, and a one month 95% confidence range lower and upper boundary (around an assumed SPX of 1800) can be calculated as 1644 and 1956 respectively.

For the non-VIX investor, the VIX may contribute two important signals for overall portfolio management.

- ▲ *First, relative changes in VIX may be a good indicator of changing sentiment among professional traders – when the VIX is increasing, market uncertainty and the risk of a selloff may be rising, and when the VIX is decreasing, market uncertainty and the risk of a selloff may be abating.*
- ▲ *Second, volatility measures may have some informational value in measuring the envelope or range of market outcomes taking into account the limitations above.*

In practice, there are limitations to using any volatility measure in a predictive manner.

- ▲ First the implied volatility expressed as VIX is an amalgamation of actual implied volatilities which are numerical inputs to a generalized Black-Scholes-Merton-like option pricing model, and as such, the VIX may reflect more of an averaged model input which may not directly translate to expected price moves.
- ▲ Second, markets will rarely behave in a manner predicted by statistical distributions and symmetrical bell curves - students of the markets generally know that market distributions are prone to "fat tails" (large percentage market moves are under-predicted by many statistical estimates).
- ▲ Third, in practice, individual implied volatilities are subject to both skew (i.e. implied volatility varies across strike prices and risk premiums) and risk premiums, and the individual implied volatilities will generally not be consistent across strikes and maturities – the VIX averages these effects.
- ▲ Fourth, volatility measures of near-term daily movements around an average value are not direct substitutes for standard deviation measures relating to distributions typically used in options pricing.

Uninvestable VIX

What about VIX is really unique?

Journalists, researchers and ETF sponsors often highlight the fact that VIX (the primary “spot” measure of equity volatility) is not directly investable. What’s typically lost in the “uninvestable VIX” dialogue is that a great many of the markets served by the ETN and ETF markets are also uninvestable. For example, virtually every one of the 24 S&P GSCI® components are also uninvestable – for example crude oil, natural gas, cattle and hogs cannot be directly held by any investment vehicle or financial investor. Investors and traders access many exposures through futures or derivatives positions and in many instances, the actual exposure is uninvestable.

So with respect to direct investability (or uninvestability), VIX is not special, so the perceived idiosyncratic nature of volatility investing is probably not solely attributable to its reported uninvestability.

VIX – Points Along the Term Structure

Continuing with the theme in Figure 2 above, a more accurate depiction of the volatility markets may be to consider the volatility market (from spot-through-forward) as a collection of related sub-markets rather than a unified market.

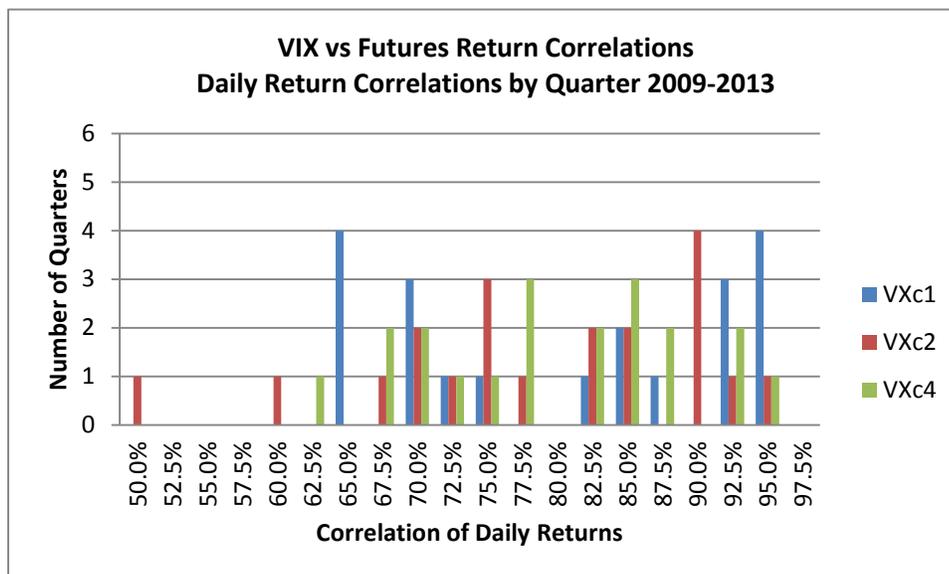
The temporal nature (and general non-substitutability) of each point along the VIX term structure can be understood by considering that each volatility number, whether it’s the spot VIX published later today or the expiry settlement of a VIX futures contract 4 months from now, relates to a forward-looking 30 day implied volatility at that time of determination. While some traders use correlation associations to bridge volatility values across time, the market linkages within the volatility market are statistical and may be more casual and less causal – traders and arbitrageurs in the volatility market cannot use borrowing, lending, grain silos, or tankers to bridge the term structure.

If the relationships among points on the volatility term structure are more casual, it may be important to look at the relative stability of the relationships...product design that relies on a multiple futures expiration strategy (e.g. long-only multiple contracts, long-short, or optimized rolls) is probably designed to operate in particular market conditions...

Figure 3 below illustrates the daily return correlations of spot VIX and three points along its term structure. In the histogram, the daily returns of spot VIX are correlated with the daily returns of each of the continuous front contract (VXc1), the continuous second contract (VXc2), and the continuous fourth contract (VXc4). The correlations were run intra-quarter, and there are 20 quarters depicted for each correlation pair for the 5 years spanning 2009 through 2013.

The volatility correlations show an average value of 78% (across all pairs and quarters) and a relatively higher degree of dispersion – the high dispersion and middling correlations do not suggest bankable strategies. Products or strategies which are based on a particular curve relationship are likely to experience performance variation relative to their intended strategy when foundational relationships break down.

FIGURE 3



Source: Thomson Reuters, calculations AccuShares

Are points across the VIX term structure substitutes for one another?

Because the volatility market lacks strict arbitrage conditions along its term structure, and because each point of the term structure is linked to a separate and distinct SPX expiry, general substitution of one volatility index or future for another is probably not broadly advisable. Different types of traders and investors are likely to be affected differently by substituting one index or contract for another – it may appear more “cost effective” to hold longer dated futures contracts because of their typically lower decay properties, but it’s probably safe to say that not all traders and investors should make that kind of substitution.

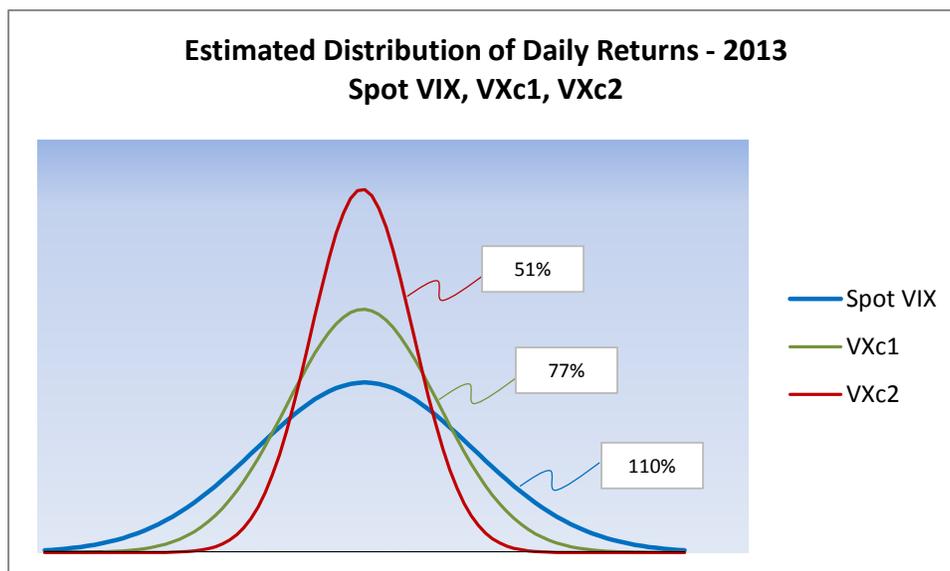
For a trader or investor who holds relatively consistent positions over long periods of time, and who also believes that under and over performance differentials will generally average out over time, substituting indices or futures may have minor impacts in the long run – for example, a lost gain opportunity in one period, may be counterbalanced by a missed loss in a subsequent period.

In contrast, investors and traders who trade and manage volatility positions tactically (i.e. those who may alter their position sizes and directionally based on market conditions and news cycles) should be more mindful of the expiries to which their indices or futures are linked – for example, a surprise FOMC release is likely to impact short-term, mid-term, and long-term volatility differently.

Figure 4 examines the distribution of daily returns of spot VIX, the near-term continuous contract (VXc1), and the next continuous contract (VXc2) using daily return variance data from 2013. Similar to Figure 3, the data was aggregated by quarter to create a summary statistic for each maturity (i.e. spot, the current contract, and the next contract). While the average daily returns are statistically indistinguishable (+0.12% for spot VIX, +0.02% for VXc1, and -0.04% for VXc2), the variances around the respective daily averages are very different.

Figure 4 nicely illustrates the expectation that the variability of daily returns is inversely related to the expiry of the position – for example, spot VIX indicates a flat wide distribution indicating a wide range of outcomes, while the VXc2 (the second continuous contract) indicates a relatively narrow distribution more tightly centered around its mean. The bell curves in each instance are generated to a normal distribution from the volatility of each series. The vol-of-vol measures are displayed in the figure with spot VIX at 110%, the first contract at 77%, and the second contract at 51% - the first contract has approximately 70% of the volatility of spot, and the second contract is less than half.

FIGURE 4



Source: Thomson Reuters, calculations AccuShares

Buyers and sellers of volatility typically rely on the following feedback loop model to link volatility to market changes and economic events:

- ▲ the presence or absence of concurrent shocks and anticipated market shifts will alter the expected range of market outcomes for all market participants
- ▲ a change in the expected range of market outcomes will alter the positioning and pricing for professional traders in the options markets
- ▲ buyers and sellers of downside (put) participation will respond to shocks and shifts by increasing or decreasing demand against the backdrop of “live” professional pricing
- ▲ buyers and sellers of upside (call) participation will respond to shocks and shifts by increasing or decreasing demand against the backdrop of “live” professional pricing
- ▲ unexpectedly high or low demand (or supply) for either puts or calls will further cause professional traders to revise prices and positioning
- ▲ the VIX is designed to capture the entire dynamic on a real-time basis with a single value



AccuShares™

The Performance AlternativeSM

Trading techniques that work in other markets may not work with the volatility.

It is tempting for sponsors and traders to draw direct parallels between volatility and other markets, but this can lead to unexpected or disappointing results because the volatility market is highly nuanced. Unlike arbitrages and replication strategies that sponsors and traders employ in equities, rates and commodities, the temporal specificity and localized impact of events upon specific points of the volatility curve can whipsaw a position and produce unexpected results. Because volatility is in many ways a collection of disparate markets, undue reliance on matching forward market events against forward volatilities expiries may require a clairvoyance few sponsors or traders should attempt.

While past performance is not an indicator of future performance, it is advisable to consider how and when market changes and news cycles may be expected to impact the particular futures contract(s) or the index used by a volatility product. Tactical investors and traders who manage the direction and size of their positions in response to market changes and news cycles should pay particular attention to the trade-offs involved in futures and index substitution.