Seeking Alpha$^{\alpha}$

The Long-Term Price Action Of XIV: It's More Than Just Contango

Jan. 27, 2017 10:59 AM ET47 comments
by: David Easter

Summary

- Daily changes in the indicative price of XIV can be calculated precisely by combining four mutually-independent contributions.
- The four independent contributions include changes in volatility, effective roll costs, interest income, and ETP fees.
- Two additional factors affect the longer-term price action of XIV.
- Volatility drag significantly degrades the value of XIV price over time, but does not affect the price of VXX the same way.
- The four daily factors are not strictly isolated over longer periods. Analysis that does not account for this will be slightly inaccurate, but results will be in the right ballpark.

Introduction

In a previous article, we demonstrated that *daily* changes in the iPath S&P 500 VIX ST Futures ETN (NYSEARCA:VXX) and the VelocityShares Daily Inverse VIX ST ETN (NASDAQ:XIV) can be precisely calculated. This article extends the discussion to time frames longer than one day. It will be shown that two additional factors must be considered when time frames exceed one day. We begin by recapping the principles presented in the previous article.

One-Day Changes in the Indicative Values XIV and VXX Can be Calculated Precisely!

Official fact sheet documentation (page 1) for the SPVIXSTR index states: "The index has three components of return: VIX spot movements, futures roll yield-cost, and collateral interest." Examination of the index methodology documentation, posted on the same site, reveals two differences between SPVXST and SPVIXSTR: (1) SPVIXSTR is a real-time index, whereas SPVXSP is based on daily settlement prices; and (2) the SPVIXSTR index includes "collateral interest income", whereas SPVXSP does not. Hence, official index documentation indicates that *daily* changes in SPVSXP consist of two independent components: (1) changes in volatility, plus (2) changes due to the "futures roll-yield cost".

In two recent articles, this author revealed the precise quantitative descriptions of (1) changes in volatility and (2) changes due to the futures roll-yield cost. These two components must, without exception, sum to precisely yield the daily change in the SPVXSP index, as defined in the official methodology. For details, readers should carefully study the two articles: "*Why XIV Appreciates In Value: Debunking The Myths And Misconceptions About Contango*" (*Article I*), and Appendix I in "*How Volatility And The Roll Yield Contribute To The Price Action Of VXX In Different Market Environments*" (*Article II*). To avoid redundancy, a summary will be provided here, but complete details will not be repeated in this article. A full understanding of this article requires that the reader be familiar with the background that has previously been published.

The volatility component. As cited above, one independent component of daily changes in the short-term VIX futures indexes is the change in volatility. SPVXSTR, the underlying end-of-day index of VXX, and SPVXSP, the index underlying XIV, are based on a collection of front-month (*F1*) and second-month (*F2*) VIX futures that is rebalanced to maintain a constant 30-day (one month) average time to expiration. To accomplish this, a mathematically-defined fraction of *F1* futures is sold at the close of each day; these shares are replaced by the purchase of an *equal-dollar* number of *F2* futures.

Analysis of the index documentation reveals that the volatility component of the index, *vol*, is defined by the relationship, $vol = W1F1 + W2F2$. Here, *W1* and *W2* are the end-of-day *weights* assigned to the *F1* and *F2* futures, respectively. The respective weights are determined by two factors: a) *TD*, the total number of trading days for the *F1* futures *as F1* futures; and b) *DR*, the number of days remaining to trade *F1* futures, *excluding the current day*. To be precise, $W1 = DR/TD$ and $W2 = (TD - DR)/TD$.

The *daily fractional change* associated with the volatility component, *d(vol)*, is determined by the standard calculation: first find the difference, today's value of *vol* minus yesterday's value, then divide the difference by yesterday's value. To determine the *daily percent change*, multiply the fractional change by 100%.

It is important to emphasize that *d(vol)* is the precise quantitative description of the daily change in the independent volatility component of the index. It is not influenced by any of the other factors identified below.

The contango (effective roll) component. According to the index documentation, the second independent component of daily changes in the short-term VIX futures indexes is the change due to the "futures roll-yield cost". Several authors have correctly observed that the end-of-day rebalancing transaction, whereby some *F1* futures are sold and are

replaced by an equal-dollar lot of *F2* futures, is a zero-cost transaction (neglecting trading fees). What these authors tend to miss is that the transaction extends the average expiration by one trading day, and that the real roll-yield cost of the extension is *not* zero. In *Article I* and *Article II*, we have proved that the cost of extending the expiration to maintain the constant one-month time frame is quantitatively equal to a hypothetical transaction in which a number of *F1* futures are sold and are replaced by an *equal number* of *F2* futures. We identify this independent contribution as the effective roll, *eRoll*.

The precise mathematical expression for the daily effective roll was published in *Article I* and in *Article II*, both linked above. In summary, the total daily change due to the effective roll, *eRoll*, is given by first finding the difference between end-of-day *F1* minus F2 prices, then dividing the result by *TD*.

The fractional daily change in the index due to the effective roll, *d(eRoll)*, is given dividing *eRoll* by yesterday's value of vol.

We emphasize that *d(eRoll)* is the precise quantitative description of the daily change in the effective roll component, as identified by the index documentation. *d(eRoll)* is a pure, independent component, and is not influenced by any other factors. Because *d(eRoll)* is dependent on *F1 - F2*, it is inseparably linked to *F1/F2 contango* in the futures market.

Collateral interest income. The daily indicative values of VXX and XIV both benefit from collateral interest, *d(int)*, which is based on the return of a three-month US T-bill. The most recent 91-day T-bill rate is 0.51%, which translates to an approximate daily income of 0.0020%. Note that *d(int)* is included in the SPVXSTR index, which underlies VXX, but is not included in SPVXSP, which underlies XIV. The two indexes are simply related. The daily change in SPVXSTR, *d(SPVXSTR)* is equal to the daily change in SPVXSP, *d(SPVXSP), plus* collateral interest income, *d(int)*. This simple relationship can be used to describe the indicative values of VXX and XIV in terms of a common index, SPVXSP.

ETP fees. The fourth and final factor that affects changes in the daily indicative values of XIV and VXX is the ETP fee. For VXX, the published annualized fee is 0.89%, which corresponds to a daily fee of approximately 0.0035%. The current annualized fee of XIV is 1.35% corresponding to a daily fee of approximately 0.0054%.

Daily Changes in the Indicative Value of VXX. In the article, "*VIX Short-Term Futures ETPs: Do They Live Up To Expectations?*" (Article III), we verified that the actual daily closing prices of VXX and XIV typically vary from their respective indicative values, as defined by their tracking indexes. Nevertheless, over the *long* term, the ETP market

values track their respective indicative values quite well. Because the daily tracking error (difference between indicative value and market price) cannot be modeled in any simple manner, all discussion in this article focuses on *indicative* values.

The *daily fractional change* in the indicative value of VXX, *dVXX*, is the simple sum of the four independent components described above. Specifically, *dVXX = d(vol) + d(eRoll) d(int) - fee.* This relationship is mathematically exact for all *one-day* fractional changes in the indicative value.

Daily Changes in the Indicative Value of XIV. Because XIV is an inverse ETP, the change in the daily indicative value, *dXIV* is given by *dXIV = -d(vol) - d(eRoll) + d(int) - fee.* Once again, this is mathematically exact expression for any one-day fractional change in the indicative value.

The difference between the change in a one-day short position in VXX and a long position in XIV is given by the expression, - *dVXX* - *dXIV*. Using the relationships shown above, the difference simplifies to *fee of VXX +fee* of XIV - 2 *d(int)*. Using the current fee and collateral interest values, shorting VXX has a one-day advantage of approximately 0.0048% compared to a comparable long position in XIV. This translates to an annual advantage of 1.23%. Note that this one-day analysis assumes that the position is opened one day, and is closed the following market day. Returns for holding periods that exceed one market day are influenced by two additional factors, both of which are discussed below.

Extending the Analysis from One Day to Longer Periods: Two Additional Factors are in Play!

The above expressions for *dVXX* and *dXIV* are mathematically precise for all one-day indicative value changes. At the end of each day, the new indicative value of VXX is given by the previous day's value, multiplied by the sum, 1 + *dVXX*. To determine the final indicative value when a position is held for 20 days, the original purchase value must be multiplied by 20 terms, corresponding to 1 + *d*VXX for each day that the position is held. This reality makes it impossible to calculate precise longer term prices based on average *d(vol)* and average *d(eRoll)* values alone. To understand longer-term price action, two additional factors must be considered.

Factor 1: Volatility Drag. As used in this article, *volatility drag* refers to the difference between average daily returns and actual compound returns. Whenever volatility changes daily and there is no strong trend either up or down, compound returns will underperform

the daily change average. This is illustrated by a $100 stock that loses 50% one day (new value = $50), and then gains 50% the next day (final value = $75). Although the daily change average is 0% in this example, the cumulative change is -25%. In different terms, whenever prices change daily, volatility drag requires a *positive* average daily return to achieve a 0% cumulative return.

A key principle that further informs this discussion is the *mean-reversion of volatility*. While most stocks tend to increase in value over time, volatility, as measured by the VIX, does not. VIX is a mathematical calculation, not a stock. Although the VIX fluctuates wildly on a daily basis, over time VIX eventually reverts to its mean value. The long-term trend of spot VIX is neither up nor down, it is flat. Although daily *F1* and *F2* future prices cannot be directly inferred from VIX spot prices, it should be clear that the one-month weighted F1/F2 basket, defined as *vol* above, must also be mean-reverting. When *vol* mean-reverts, the cumulative change is 0%, requiring that the average daily change in *d(vol) must be positive* over the same time frame.

The implications may be surprising to some. When *vol* mean-reverts, which it must do eventually, the cumulative return of the volatility component is 0%. During the same time frame, the average daily value of *d(vol)* must be positive. This implies that volatility drag is a non-factor for the isolated volatility component of long volatility positions. In other words, when *vol* mean-reverts, the change in VXX is not affected by volatility drag, treated as an independent factor. In the general case, cumulative changes due to the volatility position will exactly match market changes in *vol* over the same period.

Just the opposite is true of the inverse ETN, XIV. The daily volatility component of XIV is - *d(vol)*. Over the time frame corresponding to mean reversion, the average value of *d(vol)* must be positive, as discussed. Therefore the average of - *d(vol)* must be negative. Because the cumulative return must be worse than the average daily return over the same time frame, volatility drag guarantees that the independent volatility-related component of XIV prices must be *negative* over the period when *vol* mean-reverts. This is the most important single factor that explains why XIV gains tend to underperform short VXX gains over time periods longer than one day.

These principles are illustrated in Table 1. The second column contains artificial values of 1 +*d(vol)* for each of ten market days, reflecting daily volatility component changes in VXX. The values are artificial and are more extreme than typical; however, the set is constrained by the mean-reversion assumption, *i.e.*, that the final cumulative change must be 0%. Any other set of values can be used if the mean-reversion constraint is met, and

will yield the same qualitative results.

We will define the *daily change multiplier* as the sum of 1 plus the daily fractional change. Thus, 1 + *d(vol)* is the *daily change multiplier* for volatility. To obtain the absolute end-of-day value of an index or ETP, the *daily change multiplier* is multiplied by the previous day's closing value. Column 2 represents the daily change multipliers for the isolated volatility component.

Table 1. The Effect of Volatility Drag when Volatility Mean Reverts

Day	**1 + *d(vol)***	**cumulative**	**1 - *d(vol)***	**cumulative**
1	1.1000		0.9000	
2	1.1000	1.2100	0.9000	0.8100
3	1.1000	1.3310	0.9000	0.7290
4	1.1000	1.4641	0.9000	0.6561
5	1.1000	1.6105	0.9000	0.5905
6	0.9091	1.4641	1.0909	0.6442
7	0.9091	1.3310	1.0909	0.7027
8	0.9091	1.2100	1.0909	0.7666
9	0.9091	1.1000	1.0909	0.8363
10	0.9091	1.0000	1.0909	0.9123
Cumulative Change		**0.00%**		**-8.77%**
Avg Change	**0.45%**		**-0.45%**	

The third column represents the *cumulative change multiplier*. It is calculated by

multiplying the previous day's *cumulative change multiplier* (col 3, previous day) by the current *daily change multiplier* (col 2*)*. As required by the mean-reversion constraint, the final *Cumulative Change* must be 0% in this example, but the average daily change (*Avg. Change*) is +0.45%. This confirms (1) that an absolute 0% cumulative gain in *vol* requires a positive average daily gain, *i.e*., that mean-reversion requires a *net positive* average daily gain in *d(vol)*; and (2) over any mean-reversion time frame, volatility drag is *not* a factor in the compounded change in the isolated long-volatility component of VXX.

The fourth column contains artificial values of daily change multipliers for an inverse ETP like XIV over the same 10 days. The daily value in column 4 is equal to two minus the value in column 2. The fifth column collects the cumulative change multipliers for the short volatility position. As expected, within a mean-reverting time frame, the average daily change in - *d(vol)* must be *negative* (-0.45%), and the cumulative change must be even more negative than the daily average (-8.77%). This emphasizes the influence of volatility drag in terms of degrading the value of inverse ETPs like XIV.

Any set of *daily change multipliers* can be used in column 2, provided that the mean reversion constraint is met. For any such set, the *qualitative* conclusions stated above will be confirmed: volatility drag is a non-factor in the cumulative volatility component of VXX, whereas volatility drag significantly degrades the cumulative volatility component of XIV. This difference is the most important factor that explains why long XIV positions typically underperform short VXX positions over limited time frames that exceed one day.

Although the above example was constrained by a mean-reversion assumption, the same qualitative results apply in the general case when volatility is not mean-reverting. This is demonstrated by the three examples below.

Factor 2: Cross Contamination of the Four Independent Daily Contributions. The four contributing factors, *d(vol)*, *d(eRoll)*, *d(int)*, and *fee* are completely independent on a one-day basis, and the daily change in the indicative value of VXX can be precisely calculated from these four contributions as discussed above. The same is true of XIV. It does *not*, however, follow that cumulative change multipliers for each of the four components, assumed to be isolated over multi-day time frames, can be used to precisely calculate the cumulative gain for multi-day periods.

The *daily change multiplier* (as in column 2 of Table 1) consists of the sum of four independent daily contributions. The *cumulative change factor* (as in column 3 of Table 1) is based on the *product* of the previous daily factors. In other words, the *cumulative change factor* represents a product of daily sums. If the four contributions were completely

isolated over all time frames, the cumulative change factor of the pure volatility contribution would be determined as described above: multiply the daily change factor of that component by the preceding day's cumulative change factor. The problem is that the true cumulative change factor is based on multiplication by the preceding day's cumulative change factor *of the ETP*, which is influenced by all four contributing factors. In other words, over periods longer than one day, the cumulative change factor of the ETP is influenced by previous changes in *all four* contributing factors. This *cross-contamination* of the four daily contributions makes it impossible to precisely determine the cumulative gain of an ETP like VXX or XIV, based solely on the (incorrect) assumption that the four contributions can each be treated as isolated over time frames longer than one day.

To illustrate this concept, consider Table 2. The data in columns 2 and 3 were randomly generated. Only the volatility and *eRoll* components are included (neglecting income and fees) to simplify the example. For each of 10 days, the *daily change multiplier* is tabulated for the volatility component (col 2), the *eRoll* component (col 3), and the overall index (SPVXSP) (col 4). The value for the index is equal to col 2 plus col 3 minus 1. The cumulative change multiplier of the index is tabulated in column 5.

Table 2. Cross Contamination of the Independent Daily Contribution Components Over Time

Day	***d(vol)* + 1**	***d(eRoll)* + 1**	***d(SPVXSP)* + 1**	**cumulative**
1	1.0048	0.9945	0.9993	0.9993
2	1.0723	0.9809	1.0532	1.0525
3	0.9076	0.9859	0.8935	0.9404
4	0.9406	0.9835	0.9241	0.8690
5	1.0983	0.9903	1.0886	0.9460
6	1.0929	0.9832	1.0761	1.0180
7	0.9919	0.9908	0.9827	1.0004

8	1.0589	0.9903	1.0492	1.0496
9	0.9898	0.9898	0.9796	1.0282
10	1.0076	0.9933	1.0009	**1.0291**
cumulative	**1.1565**	**0.8884**	1.0275	**102.91%**
% change	**15.65%**	**-11.16%**	2.75%	**2.91%**
error			**-0.16%**	

The 12th row (labeled cumulative, columns 2-4) shows what the results would have hypothetically been if the contributions from *vol* and *eRoll* were completely independent over the 10-day period. In this hypothetical, but incorrect scenario, the volatility component would have contributed a gain of 15.65%, and the *eRoll* component would have contributed a loss of 11.16%. The overall hypothetical cumulative change multiplier (col 4) of the index would be the product of the cumulative change multipliers of the two components, resulting in a net hypothetical gain of 2.75%.

Compare this to the actual cumulative index gain of 2.91%, as shown in column 5. Because the contributing components are not completely isolated after the first day, the invalid assumption introduces an error of 0.16% in the final price calculation. In this example, the error is small, but real.

Table 2 confirms that cross-contamination of the contributing factors makes it impossible to precisely calculate the final index or ETP price over a multi-period day, when the complete isolation of contributing components is incorrectly assumed.

Historical Analysis of VXX and XIV Indicative Prices

To illustrate the principles developed above, we will present the relevant results over an arbitrary four-year time frame, using real historical prices for the 30-day weighted futures basket (*vol*), *eRoll*, and ETP fees. We have used a constant value of 0.51% for the collateral interest income ((*int)*), which is not quite accurate, but is harmless to the overall qualitative results.

We chose the four-year time frame from July 29, 2011, through July 29, 2015. Our

calculation opens a position at market close on 7/29/11, when *vol* closed at $21.100. The position was held for four years, then closed on 7/29/15, when the closing price of *vol* was $14.465. Note that this analysis is general, and does *not* depend on mean-reversion. Over the historical four-year period, the price of the 30-day weighted futures basket, *vol*, decreased by 31.45%.

Results of the analysis are summarized separately for VXX and XIV below. It bears repeating that this analysis is based on the *indicative* ETP prices, which can be calculated precisely.

VXX. Table 3 shows the four-year results for VXX. Entries in Tables 3 and 4 consist of *cumulative change multipliers* in row 2. These are converted to the equivalent percent changes in row 3.

Table 3. Summary of VXX Indicative Price Analysis over Four Years

Cumulative eRoll	***Cumulative vol***	***Cumulative fee***	***Cumulative int***	**if isolated**	***Cumulative* VXX**	**error**
0.0660	0.6855	0.9650	1.0205	**0.0445**	**0.0436**	
-93.40%	-31.45%	-3.50%	2.05%	**-95.55%**	**-95.64%**	**-0.10%**

Columns 1-4 identify the cumulative results for each of the four contributing factors treated as if they were completely isolated over the four-year period.

The first important result is the that cumulative change due the *volatility* component shows a loss of 31.45%, *which exactly matches the actual change in vol* over the four-year period. This result confirms that volatility drag is *not* a factor for unleveraged long volatility positions. For VXX, the isolated volatility component will always track price changes in *vol* precisely.

The isolated *eRoll* component indicates an overall loss of 93.40%. Qualitatively, this result is well known. Because *eRoll* is defined in terms of the difference, *F1* - *F2*, it is inseparably linked to *F1*/*F2* contango. Whenever *F1*/*F2* contango exists, which is the norm in calm markets, the *eRoll* factor works to degrade the price of VXX.

Isolated ETP fees and residual income contribute -3.50% and +2.05%, respectively, for a small net decrease of 1.45% over four years.

If the four components were isolated over the four-year period, the cumulative change in VXX would be -95.55% (col 5). Compare this to the actual cumulative change of -95.64% (col 6). Cross-contamination of the four contributors affects the overall result by 0.10%. While this is small on an absolute scale, it represents a 2% error in the calculation of the *final VXX indicative price*, which is 4.36% of the initial VXX price.

XIV. Table 4 shows the results for XIV over the same four-year time frame.

Table 4. Summary of XIV Indicative Price Analysis over Four Years

Cumulative eRoll	***Cumulative vol***	***Cumulative fee***	***Cumulative int***	**if isolated**	**Cumulative XIV**	**error**
14.9377	0.2162	0.9472	1.0205	**3.1213**	**3.0612**	
1393.77%	-78.38%	-5.28%	2.05%	**212.13%**	**206.12%**	**-6.01%**

The first thing to notice for the inverse ETP is that the effects of volatility drag are large and significant. The isolated volatility component shows a loss of 78.38% over the four-year period. If volatility drag were completely absent, the actual change of -31.45% in *vol* would have translated to a gain of 31.45% in the inverse ETP. The huge difference caused by volatility drag is the primary reason that, over limited time frames longer than one day, short VXX positions typically outperform long XIV positions.

The isolated *eRoll* contribution, which benefits from normal contango in the *F1*/*F2* futures, indicates a whopping gain of 1,393.77%. Clearly, much of this gain is erased by the effects of volatility drag.

Isolated ETP fees and residual income contribute -5.28% and +2.05%, respectively, for a net decrease of 3.23% over four years.

If contributions of the four components were completely isolated over the four-year period, the cumulative change in XIV would be +212.13% (col 5). This compares to the actual cumulative change of 206.12% (col 6). Cross-contamination affects the overall result by 6.01%. While this is larger than that of VXX on an absolute scale, it corresponds to a 2% error in the calculation of the *final XIV price*, which is 306.12% of the initial purchase VXX price. In this four-year analysis, the percent contribution from cross-contamination is approximately 2% of the final ETP price for both VXX and XIV.

Conclusions

Daily price changes in the indicative values of VXX and XIV can be precisely calculated by the appropriate combination of four independent contributions: the change in volatility; the effective roll yield, which is inseparably linked to contango; collateral interest income, and ETP fees.

Over periods longer than one day, two additional factors are in play. Volatility drag does not affect the price of VXX (long volatility), but it does effect a significant degradation in the price of XIV (short volatility). This is because volatility is mean-reverting, which implies that the *average* daily change in the long volatility component of VXX tends to be slightly positive over time.

In the long term, the effective roll cost, which is inseparably linked to *F1*/*F2* contango, plays a large role. Given that contango is the norm in the short-term futures market, *contango* is the most important cause for the deterioration of VXX prices. Contango also affects increases in XIV prices, but a significant fraction of the gains from contango is erased by the effects of volatility drag.

Cross-contamination of the four factors, identified in the first paragraph, over time frames longer than one day, make it impossible to precisely determine cumulative gains based on purely independent contributions of the four factors. Over a four-year time frame, performing the calculation as if the contributions were isolated introduced a relative error of 2% in the final prices of both VIX and VXX. Even though the incorrect calculation produced a small error, the procedure may be acceptable for ballpark estimates. The error is expected to be negligible over short time frames, but should increase as time frames grow longer.

The article asserts that short VXX positions *typically* outperform long XIV positions over limited time frames longer than one day. This should *not* be considered a recommendation to short VXX. Shorting stocks and ETPs have other significant disadvantages and risks that are not discussed in this article.

This article focuses on longer time periods, and identifies factors that influence long-term price changes in both VXX and XIV. One must be careful not to blindly apply the results to short-term trades. Over the same four-year period that was analyzed in Tables 3 and 4, the median magnitude of *d(vol)* was 2.22%, while the corresponding median magnitude of *d(eRoll)* was 0.33%. Comparing the two, the volatility contribution was typically *6.7% times larger* than the contango contribution on any given day. For one-day trades, it should be

clear the most important consideration is the expected change in volatility, and only minor consideration should be given to contango.

Everything stated about XIV in this article applies equally to the ProShares Short VIX Short-Term Futures ETF (NYSEARCA:SVXY). Although there are some differences between XIV and SVXY (see *Article III*), the historical market performance of both ETPs is comparable.

Beware that volatility ETPs are extremely volatile and bear the risk of significant trading losses. Individuals are advised to carefully evaluate their personal risk tolerance before trading any of these vehicles. With only a few exceptions, I recommend against holding a long position in VXX or in the ProShares Ultra VIX Short-Term Futures ETF (NYSEARCA:UVXY) for longer than one day. Consistent with this, my current long VXX position (see Disclosure) was opened on 1/26/17 and will be closed on 1/27/17.

Disclosure: I am/we are long VXX.

I wrote this article myself, and it expresses my own opinions. I am not receiving compensation for it (other than from Seeking Alpha). I have no business relationship with any company whose stock is mentioned in this article.

Comments (47)

toombsb
David

Is it possible to state the periodic increase in XIV if, hypothetically, the VIX were to stay perfectly flat for an extended period of time at, let's say, 12?

Thanks,
Bob

27 Jan 2017, 10:50 AM

18214212
David, one of the best articles ever on the topic - thanks. Wish more folks would stop pumping XIV as the greatest investment ever, and discuss the risks.

27 Jan 2017, 11:37 AM

bobtcat2

David Easter, Contributor
Author's reply » Bob - Qualitatively, yes. If your hypothetical includes an absolutely flat price for the 1-month VIX futures (vol), the volatility contribution in Table 4, col 2 would be zero. In that hypothetical, contango would be the dominant factor (col 1), with much smaller contributions from collateral interest and ETP fees. I think we both recognize that the hypothetical in not realistic in real markets.

27 Jan 2017, 11:46 AM

Stanford Chemist, Marketplace Contributor
Useful, thanks. I've also intuitively felt that short VXX was more profitable than long XIV.

27 Jan 2017, 11:59 AM

Dane Van Domelen, Contributor
Thanks for the extremely well done analysis. Very clever proof of why short VXX outperforms XIV: mean reversion -> mean positive d(vol) -> mean negative -d(vol) -> cumulative loss for XIV.

Looking at XIV, it seems that eRoll from contango is the primary driver of growth. So I would have to imagine you are using or at least considering contango-based long XIV or short VXX positions. Is there a contango cut-point you recommend? Sorry if I missed it in other articles.

27 Jan 2017, 12:03 PM

David Easter, Contributor
Author's reply » Dane,
On a one-day basis, volatility-based changes are typically 6-7 times larger than contango-based changes. If I have a strong feeling about a volatility change, I normally neglect the contango element for 1-day trades. Over the longer term, contango will fluctuate. I do not have a specific contango-based rule for exiting a long XIV position, although backwardation/contango does play a role in my strategy for trading XIV over longer timeframes. For details, see my blog post, http://seekingalpha.co....

27 Jan 2017, 12:16 PM

Ipitzalis

Hi David,

Wow. I've always wondered about the differences in price action between VXX and XIV. Thanks for the excellent article on this.

I'm going to go out on a limb, and make a statement:

"For traders who short volatility with multi-day long positions in XIV, they would be wise to instead use short positions in VXX"

Question: Do you agree with the above statement?

27 Jan 2017, 12:04 PM

David Easter, Contributor
Author's reply » Ipitzalis,
Shorting VXX has risks that are not discussed in the article. For this reason, I do not currently recommend shorting VXX. I intend to do additional research which may or may not modify this. Hopefully some readers will submit their comments on the advantages/disadvantages of shorting VXX to add to the discussion,

27 Jan 2017, 12:22 PM

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bazooooka
Ipi,

Borrow costs and the fact that losses can be drastic/unlimited (well over 100% of initial investment) is why many prefer xiv even if it is less efficient. Many would d rather lose their investment than multiples of it if/when we ever have another huge volatility spike. Now option trading might make better use for those who want multi-day short vol trades.

30 Jan 2017, 03:51 AM

VIX Strategies
Wow - easily the most thorough and detailed piece on the vol ETN's I've read on Seeking Alpha. Well done, David!

If we see backwardation for an extended period of time (I realize this is not the norm), vol drag will impact VXX much like it does XIV during extended periods of contango, no?

27 Jan 2017, 12:07 PM

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bobtcat2
Vix strategies I'm blown away by the 100% annual returns you've generated. I'm just wondering if you think this is something that's sustainable, or was it an artifact of low interest rates/QE. It feels like I'm late to the party, but if I could double my money just once from here I'd happily exit the markets forever.

28 Jan 2017, 03:00 PM

VIX Strategies

bobtcat2
Well stated! Of course, one must be prepared to lose it all, and some will. I remember that 2011 600% rise in TVIX that took some folks out feet first!

29 Jan 2017, 03:38 AM

David Easter, Contributor
Author's reply » VIX Strategies,

Thanks for the kind words.

To your question, the answer is no. To a first-order approximation, contango does not affect the independent volatility component. Within this approximation, the cumulative change due to volatility (treated in isolation) will be equal to the actual change in vol over the same period, with no additional degradation due to volatility drag.

That said, assuming your hypothetical, the effect of cross-contamination between vol and eRoll contributions over multi-day timeframes will likely effect a larger deterioration in the price of VXX, compared to the deterioration shown in the article's examples for typical markets in which F1/F2 contango dominates. So while your intuition is correct, the underlying cause is the multi-day cross-contamination of vol and eRoll, not volatility drag.

27 Jan 2017, 12:50 PM

MadScientist
Excellent discussion - I personally trade in and out of XIV based on contango levels, not really on the VIX spot like most "newbie" volatility traders (no disrespect intended).

27 Jan 2017, 01:44 PM

Gumptive
Thank you for this excellent analysis.

27 Jan 2017, 02:12 PM

JimiCarr
David - How are you calculating profit on short sale of VXX?

27 Jan 2017, 05:55 PM

David Easter, Contributor
Author's reply » JimiCarr,

I will use an example to illustrate. Supposed I open a position by short selling a stock valued at $200. Sometime later I close the position by buying to cover the same stock at $160 a share.

My gross profit is $200 - $160 (initial sell price minus final buy price), or $40. My fractional gain is the gross profit divided by the opening short-sell price (original investment): $40/$200, which is equivalent to a 20% gain in this example.

27 Jan 2017, 06:39 PM

JimiCarr
Thanks. I was looking at a recent example comparing long XIV with short VXX. I went long XIV on November 14th after the election. The price was $39.09 and closed yesterday at $62.33 for a current gain of 59.5% (my position remains open). On 11/14, VXX was $31.29 and closed yesterday at $18.97. Using your calculation, the profit on the short position would be 39.4% (31.29-18.97)/31.29. This seems to run counter to your position that short VXX will produce better returns over longer periods. Can you help me understand this?

28 Jan 2017, 09:02 AM

User 10318561
@jimiCarr,

In exactly circumstances like you picked of the last 6 weeks, when XIV is going straight up, it is going to actually outperform short VXX.

Most of the time there is more volatility when holding Xiv long and then the daily rebalancing works against it.

In other words, this short run of the last 6 week period is just that a short run. The key point being made by David is about XIV long underperformance to VXX short over the longer term.

RV

28 Jan 2017, 09:32 AM

User 10318561

JimiCarr
Thanks RV. Including August 2015 definitely changes the math but also created an opportunity to move to the dark side and go long VXX.

28 Jan 2017, 12:41 PM

David Easter, Contributor
Author's reply » JimiCarr,

An excellent question, and congratulations on your trade!

First let me emphasize that my position is that a short VXX _tends to_ produce better returns over _limited_ timeframes longer than one day. (The qualifiers are important.)

You are correct. Your example is a clear case when the general tendency does not hold.

The general tendency, that volatility drag tends to degrade the price of XIV, is strictly valid in markets that have a healthy balance of both up days and down days. However, over stretches when the XIV price moves consistently up, with few down days, the "volatility drag" effect will actually have a result that is opposite to the general tendency: it will enhance the price of .XIV.

Your example represents a special case that is an exception to the general tendency, because volatility has been consistently moving in a single direction (decreasing) since the election. As a result, XIV has outperformed a short VXX position over this period.

To summarize, whenever the direction of volatility is consistently down over time, with few up days, the general tendency stated in the article will not apply. In these specific cases, a long XIV position should outperform a short VXX position. Just one more factor that traders should consider when deciding between long XIV and short VXX!

28 Jan 2017, 09:46 AM

Learner16
Thank you for the article Mr Easter. It needs more than one reading but it seems to me it is worth the time.

28 Jan 2017, 12:24 PM

bobtcat2
Short VXX wiped out two friends of mine in 2011 when it tripled. They obviously were in heavy. I'm curious what's

the most anyone here would put in their portfolio of short VXX or long XIV? I'm in the unfortunate position of having lost half my money the past 2 years from SUNE and VRX so need to double it to get back. Temping to load XIV as it goes up seemingly every single day, but a 10% correction in stocks would hit it for 50-80% loss. What to do, what to do.

28 Jan 2017, 02:22 PM

VIX Strategies
No more than you're willing to lose. Our stance is that vol strategies are meant for the "aggressive" allocation of an overall diversified portfolio. Having the mindset of trying to make back losses usually ends poorly.

28 Jan 2017, 05:25 PM

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lpitzalis
Bobcat: You might consider waiting for a spike in the VIX before establishing a short position with XIV or VXX.

While I am riding a SMALL XIV position now, I am waiting for that spike in volatility before I deploy additional funds.

Since VIX reverts to the mean after it spikes, it's worth waiting for the spike!

As for the most I would deploy: I have a hard rule that no single position will ever be more than 10% of my portfolio. And I usually keep positions under 5%. This technique prevents portfolio disasters when a trade goes against you.

28 Jan 2017, 08:27 PM

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bobtcat2
Yeah I hear you- seems foolish to chase it right now with both spot and futures so low. A spike to 20s or even 30 for the VIX and it's a nice buying chance for XIV.

29 Jan 2017, 03:39 AM

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aresquared
Long xiv's loss is capped at 100%
Short vxx has unlimited loss potential.

Investors should axiomatically know which one will deliver greater proportional returns or greater proportional losses depending upon calling the correct/incorrect net direction of the underlying.

Volatility products are NOT a special case in this regard.

28 Jan 2017, 03:44 PM

gandc
The author is missing the most important issue. For me it is the single biggest loss in income because I sold too soon. XIV is one instrument that I should have held since 2013. Had I paid attention to the long term benefits of holding XIV, I would have done extremely well.

Grant

29 Jan 2017, 02:51 AM

> **bobtcat2**
> Huh? It doesn't seem like he's missing anything. We all should have bought in 2011 and held to now! Always looks easy in hindsight- but next time VIX hits 25 or more I will buy XIV and hold for 1000% or until 0.
>
> 29 Jan 2017, 03:40 AM

jerryki
Very deep and terrific stuff and I admit I was mind-numbed to the point of not reading in detail. I simply have many long-term short positions in VXX put options and put option spreads. It seems like a great strategy is to wait for an increase in VIX/VXX and simply short VXX via put options and option spreads. Maybe a 30% increase in VXX will happen once a year??? and that's good enough, because VXX will ALWAYS go to lower lows. If you wait for a 50% or 100% increase, that's even better, but you might be waiting for years.

For example, I bought Jan 2019 long 18, short 10 put spreads at about $400 each a month or two back. If you look at the projected values at expiration (use semi-log scale), there's a quite a good chance these will return about 100% over a 2-year period ($400 goes to $800). And loss is limited by working with spreads. VIX was already at a very low point. If you waited for the 30% increase in VXX, you would have entered that much cheaper.

But since VIX has gone even lower (about at an all-time low) those spreads would now cost about $470 each, and STILL show a good positive Expected Value. I'll probably hold tight here, and wait for that 30% increase in VXX, and then buy more. And if the increase should be 50% or 100% at some point, then I'd back up the truck and maybe just be buying long-term puts - no need to use spreads.

What am I missing here - this seems so easy!

29 Jan 2017, 11:33 AM

> **bobtcat2**
> I don't think you're missing anything- only caveat is we might get a third stock market crash of the generation and that would take VXX up 500% or so and then the puts are wiped out.
>
> I am looking for UVXY to hit about 40-45 here before I think about buying puts. If it doesn't happen, so be it.
>
> Indeed if VXX went up 100% (went up 200% in 2011) puts would look attractive but they would be quite expensive. I am also looking for put spreads that should return 100% in a couple years. Even if VXX goes

to 30 first, it likely will be 10 and lower by 2019. Maybe the 15/10 put spread would offer more upside.

29 Jan 2017, 07:38 PM

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xelfer1337

I don't think it's quite so simple to buy options on these products because of the high volatility skew after a vix spike. The options market will price it in.

01 Feb 2017, 10:44 PM

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jerryki

When I say above "quite a good chance", it's actually more quantitative than that. VIX has a long-term lower bound of about 10 to 11 (never gone below 10 on the 10-year chart that I have, although the divisions on that chart may have missed a short-term excursion). And thus VXX also has a corresponding lower bound which is visible on a semi-log scale. Thus one can look at the amount of time VXX spends at 10% above its lower bound, 20% above, etc. And this leads to probabilities and expected values, and the statement that there's quite a good chance these will return about 100% over a 2-year period. You can calculate an overall E.V. for the put hedges above and I don't have the numbers right in front of me, but they were very favorable at $400 and are probably still favorable at $470.

29 Jan 2017, 03:31 PM

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convoluted

Good point about length of time at any price range.

Two cities (Miami and Atlanta) happen to have the same forecast highs on a given day. Miami reaches the high an hour earlier than Atlanta, and sustains the high for 4 hours. Atlanta hits the same high, as predicted, but the high occurs an hour later; and, that high fades after 47 minutes.

If we graph this data, we observe a spike vs a plateau. Yet, the weather reporters would simply note that the high on day x was the SAME in both places.

29 Jan 2017, 10:15 PM

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bobtcat2

It looks like we *may* end up with a constitutional crisis in the US. It seems incredible the VIX is 10 given this scenario (tomorrow will probably jump to 12-13 but still low). Can anyone make sense of this?

29 Jan 2017, 10:18 PM

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woody5023

Nothing makes sense right now. I closed my short TVIX position last month near 12. It's below 6 now. with VIX near its lowest levels ever. No way I would have believed this a month ago. My current portfolio is 70% stocks. 30% treasuries. Rebalance expected in a few days. Up 8% YTD.

30 Jan 2017, 01:20 AM

bobtcat2
Well done!

30 Jan 2017, 01:22 AM

woody5023
February about to close out and my balance of SPXL, TQQQ, and TMF produced only two losses for the month so far. Those losses occurred on the 1st and 2nd of the month and only less than a 0.1% decline. Friday marked the 15th straight up day in a row. 9% gain for month. 17% YTD so far. Ratio 70/30. Rebalance coming on Wednesday.

26 Feb 2017, 04:15 PM

jerryki
Bobtcat2: You're right - it's absolutely crazy that VIX should be at about record lows when Trumpism should be sending volatility soaring. But we just take what the market gives us, and go from there.
Btw, I have both 18/10 and 20/15 Jan 2019 P spreads.

30 Jan 2017, 01:16 AM

bobtcat2
A jump to 20 in VIX would probably take UVXY from 24 to 75 given how low VIX futures are. Not likely, but I'm holding off on short VXX/long XIV until I can understand what the heck is going on. We're very near impeachment in my opinion, and I have no idea where that would take the VIX.

30 Jan 2017, 01:24 AM

Quantwerks
Hi David,

First, well written and informative.

But...

I have some serious issues with the volatility drag arguments.

1. Volatility drag is defined as the difference between arithmetic and geometric returns. As such, even the underlying indices (SPVXSTR, etc) have volatility drag. In fact, it's irrelevant because returns compound, they don't add. An arithmetic average across time periods doesn't mean anything.

2. while volatility is mean reverting, volatility futures and volatility ETPs are not. And that is what we trade.

13 Feb 2017, 01:58 PM

David Easter, Contributor
Author's reply » Quant,

To your second point, it is true that individual futures contracts do not mean revert. However, the 30-day weighted basket that defines the volatility component (vol) of the underlying index is definitely mean reverting. If it were otherwise you would observe a systematic and statistically meaningful widening (or narrowing) between vol, as defined in the article, and VIX over time. No such trend exists.

In the most narrow and technical sense, everything is affected by volatility drag, including the VIX index itself. The point is that in the long run, the effects of volatility drag do not affect the spot VIX because VIX is mean reverting. In other words, it does not lose value in the long run because of volatility drag. The same applies to the isolated _volatility component_ (vol) of the index, which is also mean reverting.

To understand the ETPs that we trade, the volatility component (vol) cannot be considered in isolation. You also have to account for contango, and to a lesser extent, fees and residual income.

13 Feb 2017, 02:48 PM

bazooooka
David, will you post again when the next XIV cycle starts? What an easy way to check for that?

10 Mar 2017, 12:16 AM

David Easter, Contributor
Author's reply » I will post it as an SA blog. Blogs are linked under my SA profile. All future posts and updates regarding my own XIV trading strategy will be in the form of blog posts.

10 Mar 2017, 09:03 AM