Not All Short Volatility Strategies Are Created Equal

With recent market volatility and devastating performance of several short VIX ETPs, volatility strategies have come under the spotlight. This spotlight has muddled many short volatility strategies together and failed to discern key characteristics of different approaches. One specific comparison which warrants comment is Cash-Secured PutWrite and short VIX ETPs. In this whitepaper, we demonstrate that these two strategies have definitively different risk-return profiles and different dependencies on a low-vol environment.

Risk-Return Profile

Cash-Secured PutWrite gives an investor exposure to two risk premia: the equity risk premium and the volatility risk premium. In such a strategy, an investor sells a put which is fully collateralized with cash and/or cash equivalents. This strategy does not use leverage and the maximum loss is the strike price of the put. The Cboe S&P 500 PutWrite Index (Cboe PUT) is a well-established representative of such Cash-Secured PutWrite strategies. From 12/30/2005 to 1/31/2018[1], the Cboe PUT generated an annualized return of 7.24% with an annualized standard deviation of 10.59%. Over the same period, the S&P 500 Total Return Index (SPXTR) returned 9.26% per annum with an annualized standard deviation of 14.13%. The Cboe PUT exhibited an upside beta of 0.448 and a downside beta of 0.810 to the SPXTR, as shown in Exhibit 1(a), with the key observation being that the downside exposure of the Cboe PUT to the underlying equity market is less than the market itself.

Short VIX ETPs are typically structured to earn the inverse daily return of a long VIX ETP or some VIX-related Index. Viewing VIX as a proxy for SPX short term implied volatility, a VIX ETP increases (decreases) as SPX implied volatility rises (falls), and similarly the corresponding short VIX ETP decreases (increases) by the opposite percentage on a daily basis. As an extreme example, if the implied volatility of short term options doubled in a day, a long VIX ETP could increase by 100%, and there would be a corresponding loss of 100% in the short VIX ETP! Historically, the S&P 500 VIX Short-Term Futures Index (SPVIXSTR) exhibited an upside beta of -2.038 and a downside beta of -5.106 to the SPXTR. That is, in a market downturn, for each 1% movement in the SPXTR, the SPVIXSTR is expected to rise by more than 5%, and consequently a short VIX ETP is expected to fall by more than 5%. The leveraged exposure to the equity market embedded in VIX ETPs can also be observed from their long-term cumulative returns as illustrated in Exhibit 1(b). Here the SPVIXSTR had a standard deviation of 67.31%, which is indicative of more violent swings relative to the SPXTR and the Cboe PUT.

[1] 12/30/2005 is the inception of the S&P 500 VIX Short-Term Futures Index which is used in subsequent analysis.

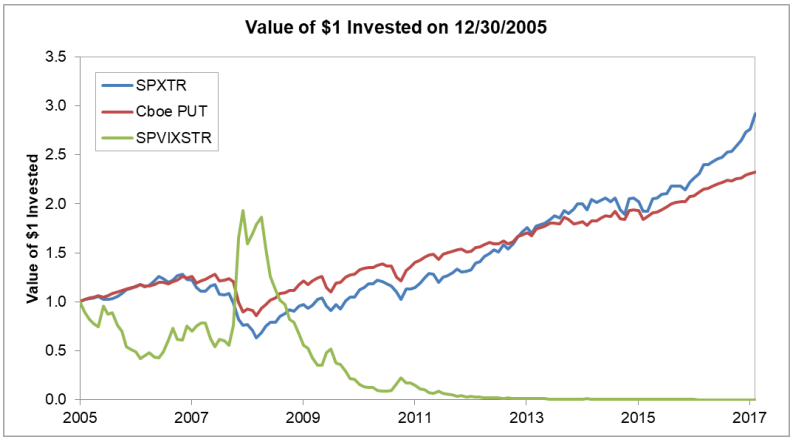
Exhibit 1: Risk Profile of Cash-Secured PutWrite vs. Short VIX ETP

Panel a: Exposure to the S&P 500 Total Return

	Cboe PUT	S&P 500 VIX ST Futures
Upside Beta	0.448***	-2.038***
Downside Beta	0.810***	-5.106***

Data period: 12/30/2005 – 1/31/2018. Source: Bloomberg and RJA analysis. Monthly returns of the Cboe PUT Index and the S&P 500 VIX Short-Term Futures Index are regressed on those of positive and negative S&P 500 total returns, respectively.
*** - significant at 1% level.

Panel b: Cumulative Returns from 12/30/2005 to 1/31/2018



Data period: 12/30/2005 – 1/31/2018. Source: Bloomberg and RJA analysis.

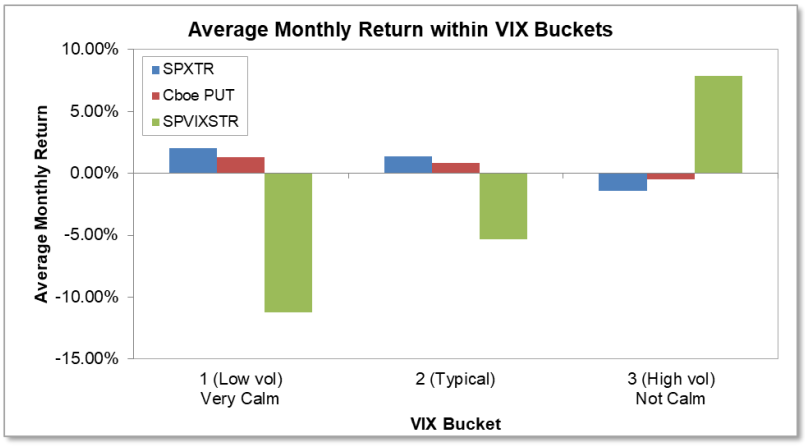
On February 5th the S&P 500 declined by 4.10%. The Cboe PUT Index dropped by 3.86% in normal trading hours, which is less than the SPXTR and consistent with our analysis above. The SPVIXSTR and the VXX (iPath S&P 500 VIX Short-Term Futures ETN) both rose by approximately 33%, but the XIV (VelocityShares Daily Inverse VIX Short-Term ETN) was not in line with this move. XIV merely dropped 14.32% by 4:00 PM even though its intraday NAV was down by 33.01%. Between 4:00 PM and 4:15 PM, the March 2018 E-mini S&P 500 Futures contract decreased by another 1.40%. As VIX ETPs rebalanced their underlying portfolios, and after hours trading narrowed the gap between the share price and NAV, the SPVIXSTR and the VXX both increased by another 48%. At the same time, the XIV plummeted approximately an additional 90% and published an end-of-day NAV of $4.22. In summary, it is immediately apparent that the risk profile of the Cboe PUT Index and short volatility ETPs are very different simply by comparing their betas, historical cumulative returns, as well as returns in a market selloff scenario.

Dependence on a Low-Vol Environment

To further elaborate on the difference between Cash-Secured PutWrite and short VIX ETPs, we examine their dependence on a "calm" market to deliver performance. By "calm" we mean a

period that ends in a low-to-typical volatility environment. It is important to note that at the beginning of a period we do not know whether the market will be calm or not. To illustrate the importance of a calm market for performance generation, we partition the data by end-of-period VIX levels. Historical VIX levels are sorted from lowest to highest and partitioned into three buckets. The 1st bucket represents months when the VIX is in the lowest 25% (low vol – very calm); the 2nd bucket represents months when the VIX is in the middle 50% (typical vol); the 3rd bucket represents months when the VIX is in the highest 25% (high vol – not calm). For each bucket, we consider the observed monthly returns on the SPXTR, the Cboe PUT, and the SPVIXSTR.

Exhibit 2: Volatility Selling in Cash-Secured PutWrite vs. Short VIX ETPs



Data period: 12/30/2005 – 1/31/2018. Source: Bloomberg and RJA analysis.

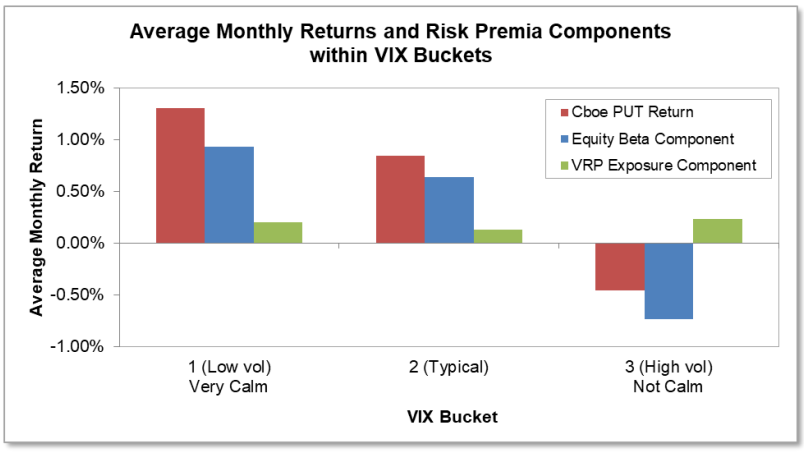
As the end-of-month VIX level increases from the 1st bucket to the 3rd bucket, the average monthly return of the SPXTR decreases from 2.03% to -1.43%, validating the observation that volatility is usually negatively correlated with the SPXTR. The average return of the Cboe PUT decreases in a similar fashion from 1.30% to -0.46%. By contrast, the magnitude of the average SPVIXSTR return is notably more substantial than that of the SPXTR and the Cboe PUT. In all three buckets the magnitude of average SPVIXSTR return is in the order of 5 times larger than the SPXTR. This cannot be attributed to market beta exposure alone. As shown in Exhibit 1(a), the beta exposure of SPVIXSTR is -2.038 in positive market return scenarios, so the results from the 1st and 2nd buckets suggest an additional return impact simply from the market being in a calm state. This is particularly relevant for short VIX ETPs since the above implies that they receive an additional return benefit during market-calm scenarios.

While it is clear that short VIX ETPs depend on a period ending in a low-vol environment to deliver positive performance, it is debatable whether the alpha generation of Cash-Secured PutWrite strategies is dependent on a calm market. As mentioned earlier, a Cash-Secured PutWrite strategy provides investors with access to two risk premia: the equity risk premium and the volatility risk premium (VRP). The next analysis aims to attribute the apparent "short vol"

exposure in the Cboe PUT to these two risk premia. This is achieved by decomposing excess returns on the Cboe PUT Index into an Equity Beta Component and a VRP Exposure Component. Since at-the-money options have an ex-ante beta of approximately 0.5, the Equity Beta Component is defined as $0.5 \times (R_{SPXTR} - R_f)$, and the VRP Exposure Component is the remaining difference between the excess return of the Cboe PUT and this Equity Beta Component:

$$R_{PUT} - R_f = \underbrace{0.5 \times (R_{SPXTR} - R_f)}_{Equity\ Beta\ Component} + \underbrace{\alpha}_{VRP\ Exposure\ Component}$$

Exhibit 3: Vol Selling in Cboe PUT Is Driven by Its Equity Beta



Data period: 12/30/2005 – 1/31/2018. Source: Bloomberg and RJA analysis.

Exhibit 3 shows, for various degrees of market calmness, the average monthly return of the Cboe PUT along with the excess returns associated with the Equity Beta Component and the VRP Exposure Component. The Equity Beta Component, as expected, displayed a negative correlation with the level of VIX. What is of particular interest is the relation between the VRP Exposure Component and the level of market calmness, proxied by end-of-period volatility. Across the three buckets, the VRP Exposure Component returned between 0.13% and 0.24% per month, and does not show a distinct pattern of positive or negative co-movement with the level of volatility.

To summarize, although the Cboe PUT Index does depend on the calmness of the market, this dependence is mainly attributable to its equity beta exposure. By contrast, short VIX ETPs have a more substantial short volatility exposure, and clearly depend on calm markets to deliver performance.

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The XIV ETP existed for approximately 7.5 years before collapsing and being forced to liquidate. Since inception in 1986, the Cboe PUT Index has provided equity-like returns with approximately 2/3 of the volatility by accessing the volatility risk premium. The strategy has weathered high and low volatility regimes, rising and falling rate environments, and multiple financial crises. Cash-Secured PutWrite is not a naked short volatility strategy and should not be misconstrued as one.

More questions?

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