Horse Cove Partners Investment Strategy

Historical Analysis of the Thesis

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Background: Options provide insurance. The option buyer is the insured and the seller is the insurer. A key determinant of the price of stock options (insurance) is the expected volatility of the underlying stock or index price. The greater the expected volatility, the higher the option price. The generally accepted measure of the expected volatility of the S&P 500 index is the VIX. It is derived directly from S&P 500 options prices using the Black-Scholes model. If the VIX (estimated volatility) is consistently higher than realized volatility, then selling options (writing insurance) is a generally profitable activity.

Based on their direct experience and observations, Horse Cove Partners, LLC (HCP) founders believe that S&P 500 option prices do, in fact, overestimate realized volatility and are richly priced. Option writers (sellers) therefore have an advantage and are generally rewarded for taking the risk. The founders are not alone in this belief as this is a rather well-studied phenomenon. Like others, they conclude that option prices will continue to be attractive for persistent structural reasons.

HCP has developed a rules-based investment process to capture the inherent value in option premiums while controlling and managing risk by following these disciplines:

1. Avoid the increased event risks associated with selling options on individual stocks. Instead, write options only on the broad market, i.e. the S&P 500 index.
2. Only write weekly options on the S&P 500 index that expire the following week.
3. Write the put options with a 99.5% estimated probability of avoiding losses. Write the call options with a 90% estimated probability of avoiding losses or higher. (Probabilities are estimated using a proprietary calculation).

   Since VIX is a one standard deviation measure, it can be used to estimate loss probabilities and set strike prices. HCP believes current VIX can be reliably and conservatively used to estimate ensuing loss probabilities. This eliminates the need to attempt to independently forecast future stock market volatility and provides for performance consistency and sustainability.

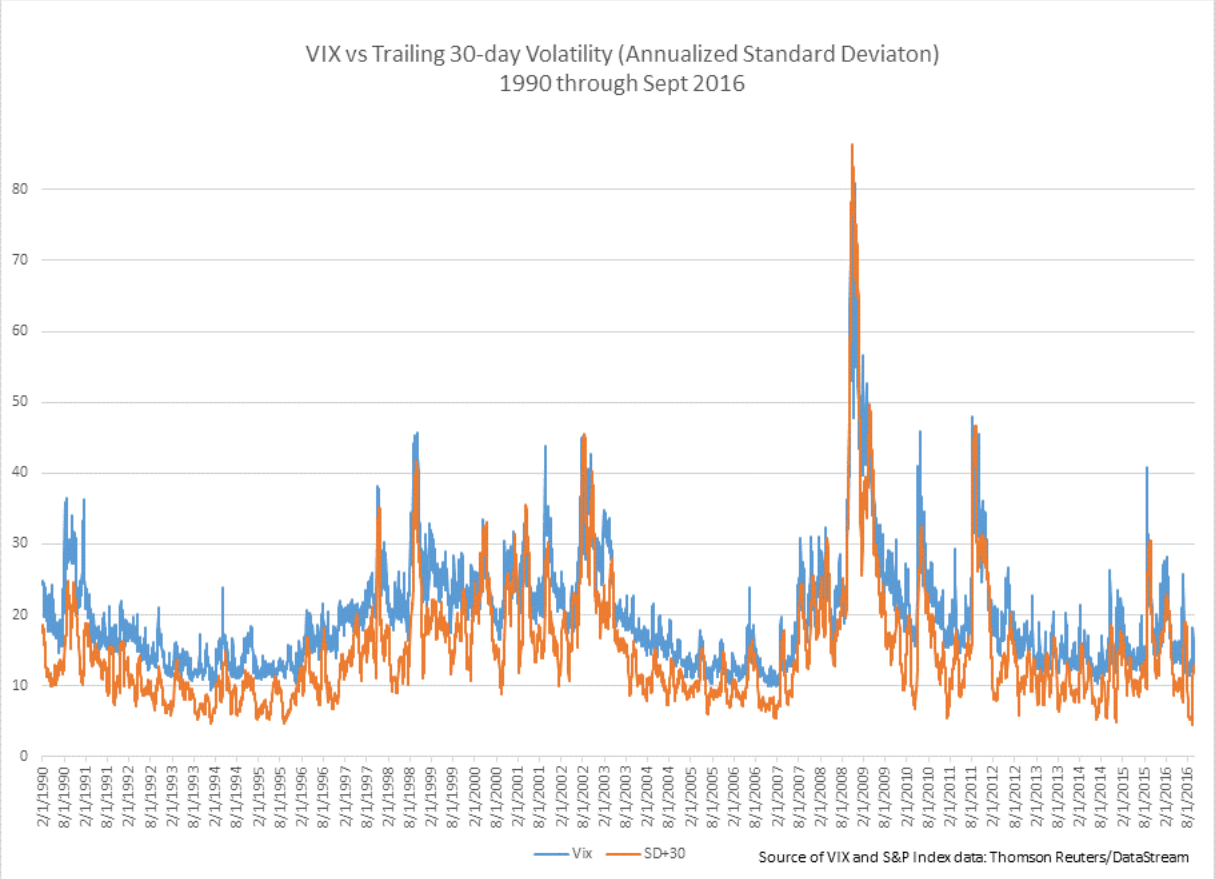
4. Always purchase downside risk protection. Limit potential losses by buying protective options at no more than 100 S&P points further beyond the short strike price.
5. After the initial option positions are established, manage risk using specific rules to determine when to close out (buy back) the positions or let them expire. A key rule is to close out any positions once the probability of success drops below 66 2/3%.

In summary, HCP has a rules-based discipline that is replicated approximately 52 weeks a year. Performance since inception in December 2010 testifies to the strategy's viability and consistency.

Because the HCP investment process is well defined and highly structured, obtaining a longer term, historical perspective on certain aspects of the strategy is possible and that is the purpose of the rest of

this paper. The constraint on how far back in history this research can be conducted is the inception of published VIX data in 1990**.**

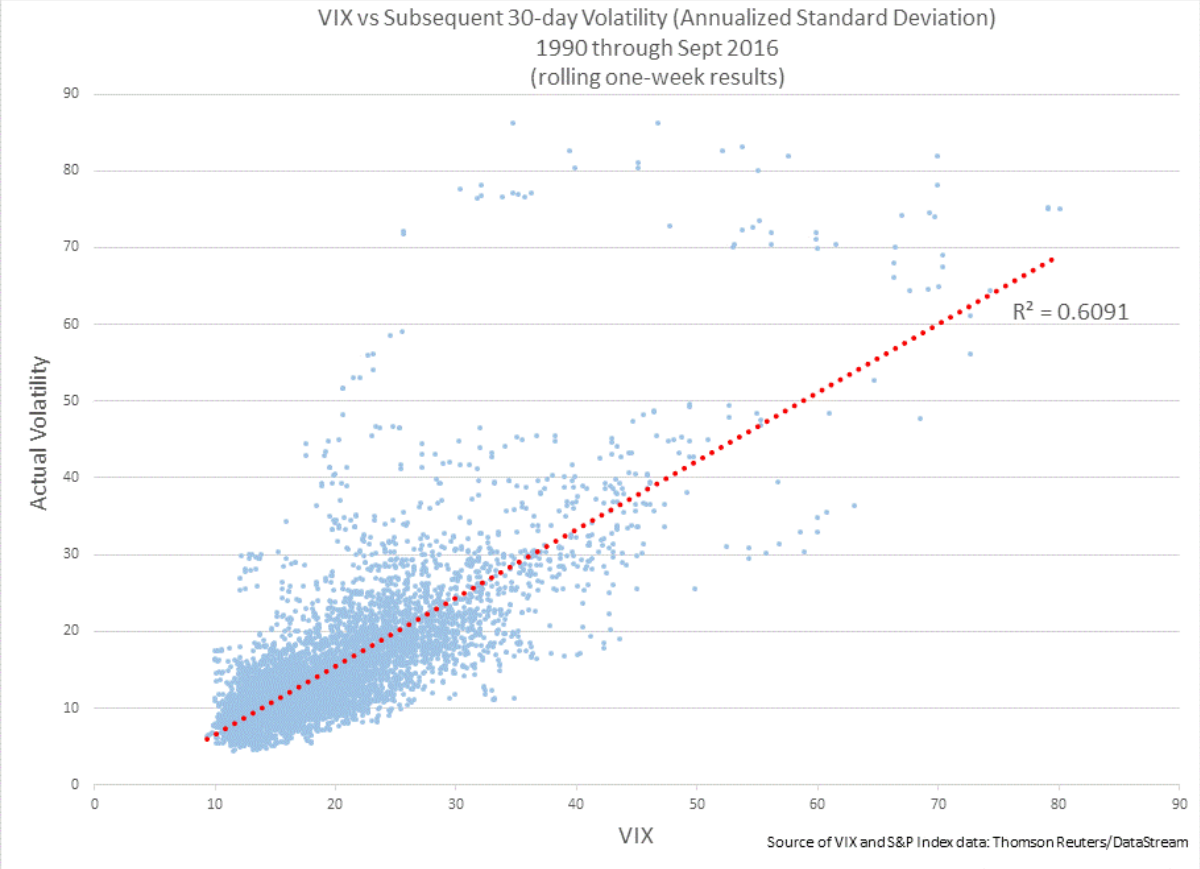
Analysis of Expected and Realized Volatility: HCP sets the strike price of options they write based upon a high probability determination that the S&P 500 will not move past that strike price. A volatility estimate is needed to determine that probability. HCP presumes that current VIX is a reliable indicator of subsequent volatility. The following graph assesses that thesis by showing the relationship of current VIX and realized volatility over the subsequent 30 days.



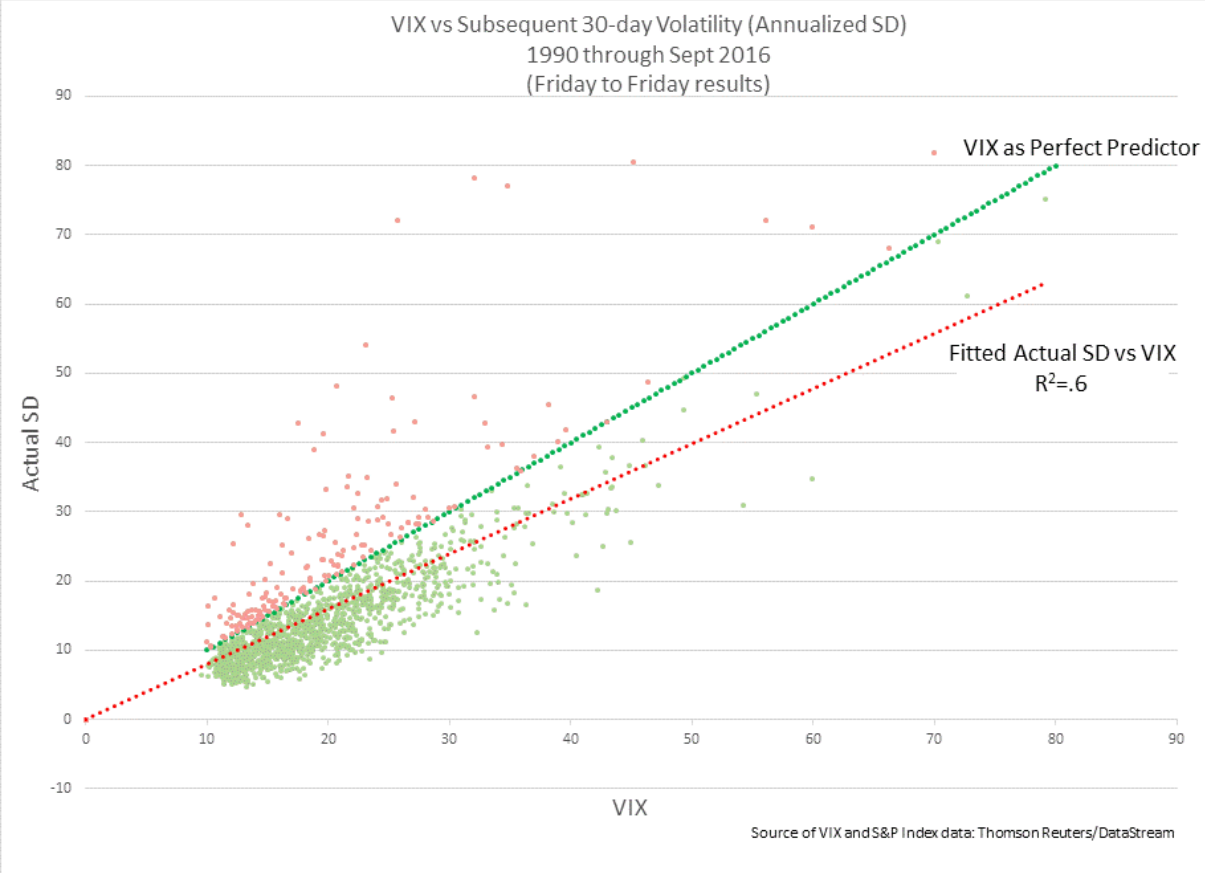
Observe that VIX and realized volatility tend to parallel each other. When the VIX is high, subsequent volatility is high and vice versa. This affirms HCP's supposition that VIX is a good estimate of the level of future volatility.

Also, observe that the VIX is usually higher than realized volatility – VIX overestimates volatility. In other words, buying options (insurance) has generally been expensive. Writing options (selling insurance) has been advantageous most of the time.

The scatter diagram (below) also illustrates how realized volatility varies with the VIX. Notice that the trendline is upward sloping, demonstrating again that when the VIX is predicting high volatility, ensuing volatility tends to be high. The statistical degree of predictability (R squared) between the VIX and realized volatility is a reasonably good 60%.



Below, a perfect 1 to 1 (VIX to realized) relationship line is added to this same graph (the number of observations is reduced to assist visualization). If the VIX was an unbiased predictor of future volatility, the number of points above and below this line would be equal. However, this is not the case, as VIX is biased as most observed points (green) are below the perfect fit line. In summary, the historical data clearly affirms that VIX is biased, so options have generally been overpriced.



Analysis of Loss Events: HCP believes VIX provides an accurate tool for estimating losses and writing weekly options with a very low probability of loss. To test this assumption, we:

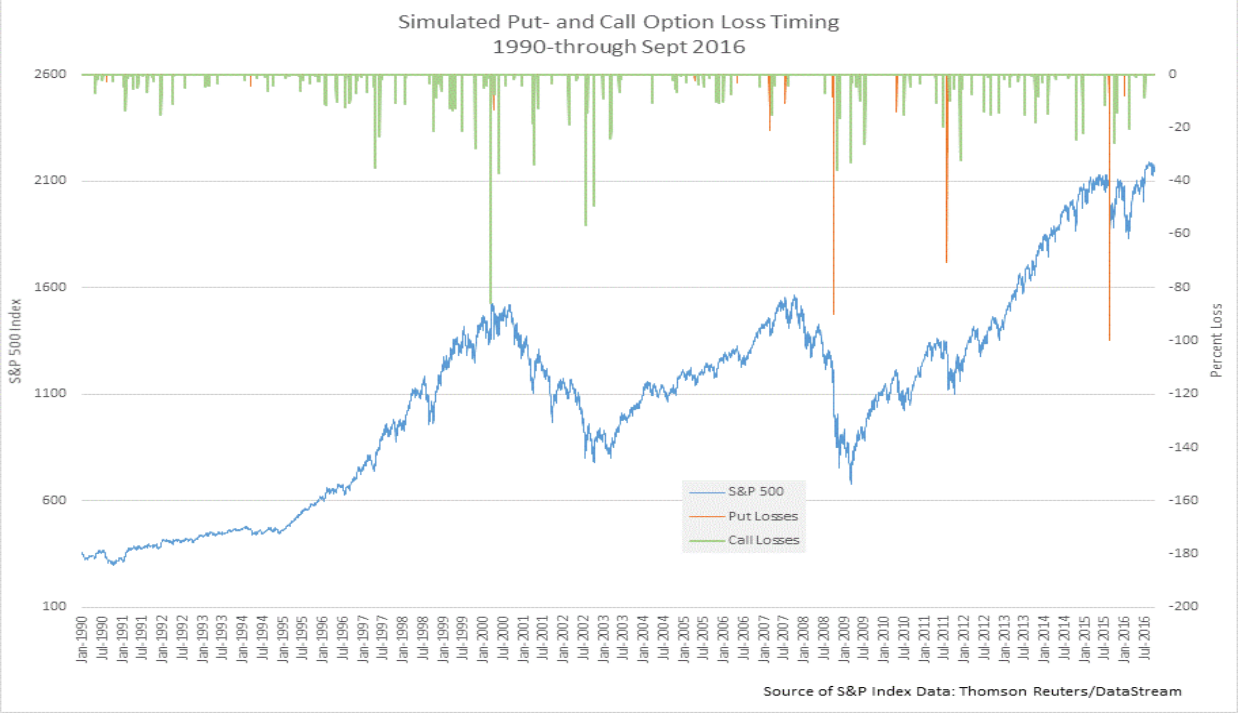
1. Created a universe of "synthetic" weeks by assuming a put and call option is sold each day that expires the next week, 7 days later.
2. Used current VIX to predict volatility and a put on the S&P 500 index is sold with a strike price that has only a 99.5 **%** probability of expiring profitably.
3. Simultaneously, a call option is sold with a strike price that has an expected 90**%** probability of expiring profitably.
4. HCP buys protective options that are 100 S&P points beyond the option strike price. This protection limits the loss in any week to no more than the capital invested.

Here is a summary of the results of this analysis for the 6,977 rolling weeks beginning in January 1990 through September 2016:

- Puts with a 99.5% expected probability of success expired profitably inside the strike price 99.63% of the weeks.
- Calls with an expected 90% probability of success expired profitably inside the strike price 95.14% of the weeks.
- Combining both puts and call, 94.74% of the weeks would have had profitable trades.

This data tends to affirm HCP's thesis as the actual results were close but better than expected, indicating that the VIX provides a reliable but conservative estimate of ensuing volatility.

The time line below illustrates when the simulated loss events occurred. There were 339 weeks when the call options resulted in a loss and 26 weeks when the puts resulted in losses (out of 6,977). This is not surprising since the calls were written to a 90% probability of success versus 99.5% for the puts.



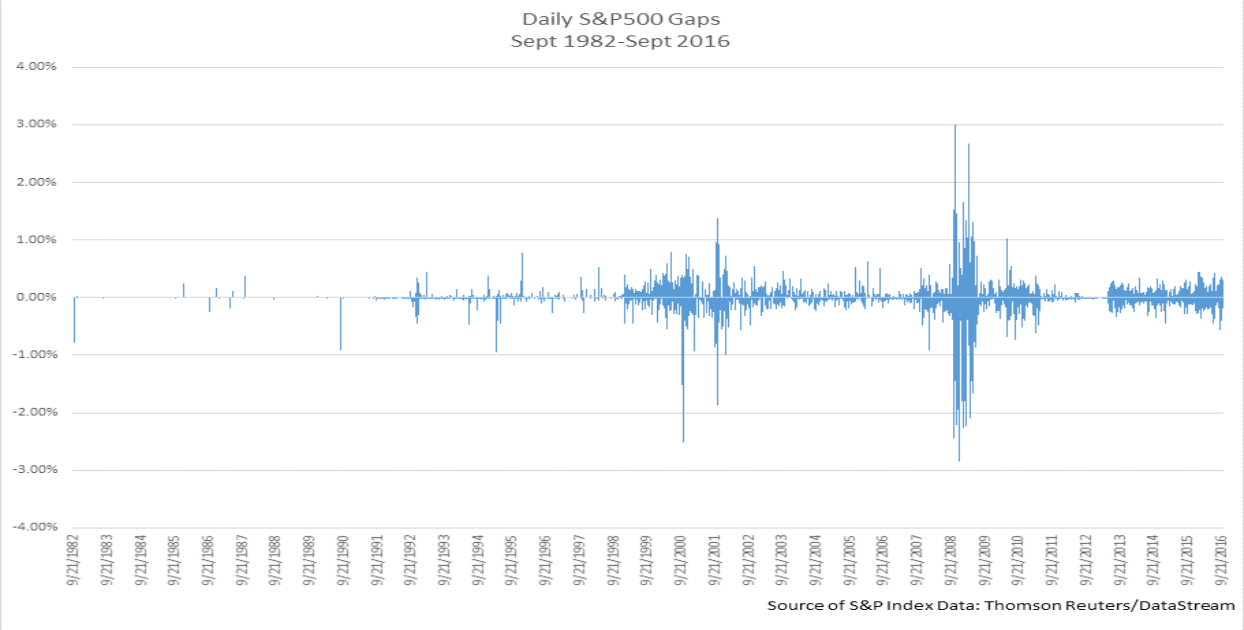
As might be expected, the call option losses predominately occurred in the bull market of 1990 through 2000. There were only four negative put trades for the first 26 years. However, the bear market of 2008 -2009 was a difficult environment for puts. It is somewhat surprising that the very worst put loss occurred in the third week of August 2015 rather than 2008-2009. August 2015 was when the market declined sharply on fed rate hike fears.

Active Risk Management. For illustrative purposes, the above analysis presumes an option portfolio is established at the beginning of the week and not managed thereafter but simply left to expire at the end of the week. In practice, HCP employs an active, rules-based strategy to actively manage risk after the initial portfolio is put in place. HCP actively determines when and if to close out (buy back) the initial options.

At first blush, the above analysis calls into question the need for HCP's rules-based risk management strategies. For example, in the six years since HCP's track record inception, defensive action has been taken approximately 15% of the weeks. Based on this historical analysis, it would only be necessary to take defensive action less than about 5% of the weeks to avoid losses. Furthermore, most of those losses were less than 5% and the average loss is less than 10%. However, the magnitude of some, albeit extremely infrequent loss events can be large, particularity August 2015. That is the reason HCP takes defensive action. Defensive action mitigates the chance of large losses by taking more frequent small loses. The fact that HCP managed through the very difficult August 2015 environment with only a 10.4% monthly loss is a testament to the benefit of systematic defensive action.

Throughout each week, using the same model and adjusting the days remaining to expiration and market levels, HCP monitors the probability that the short put or call positions will expire out of the money. If that probability drops to a 66 2/3% probability of success, HCP takes defensive action to reduce the risk of the trade. As a result, HCP have never let an option go beyond the strike price (into the money) before exiting the position. HCP terms this taking small "intelligent" losses to reduce the risk of large losses.

Overnight Risk. HCP is sometimes asked what if the S&P 500 has a major overnight move when option markets are not open? How would this impact the risk mitigation strategy? The following graph address that question by looking at the gap between the market close and the following trading day's open.



The magnitude of the single largest gap is no more than 3%. Those periods that had the large gaps (2000-2001 and 2008-2009) were periods when the VIX was high. A 3% gap size is within the opening strike price range of HCP's initial option positions each week even when the VIX is low. However, in periods of high VIX, option positions would be initially written outside of a 3% gap range. So, a 3% gap would not cause the S&P 500 to cross significantly beyond the options' strike prices, if at all. However, it is possible a risk control trade could be required at the market open. Depending on many factors, such a defensive trade could result in a modest loss. Nevertheless, the 3% maximum historical close to open gap should be manageable within risk control guidelines of HCP's strategy.

Summary: HCP's founders believe that S&P 500 option prices are generally overpriced giving option writers an advantage. They believe systematically writing short-term options with strike prices that are far "out of the money" is a low risk way to participate. HCP believes the VIX provides a valuable tool for managing risk and setting strike prices. This thesis is supported by a successful six-year track record and this analysis of historical data dating back to 1990.