HERCULES INVESTMENTS

Research Summary:

The Gamma Yield Strategy

The Investment Landscape and Gamma Yield in Context

Profit prospecting in the Liquid Alternatives investment space gained traction with the advent of quantitative models and the mainstreaming of index methodologies. Within the Equity sector, research into systematic strategies demonstrated the return generating potential of index futures and options and allowed Liquid Alternatives to grow as a complement to traditional strategies because of the ability to source pure, uncorrelated alpha streams within a portfolio thereby achieving meaningful diversified return targets.

Equity Index options enable the pricing and trading of aggregate stock market volatility. They permit the monetization of mispricing in future market uncertainty with a view on macro factors, valuation metrics and / or a play on charting technicals. They allow investors to effectively free themselves from being reactive to adverse market outcomes, to taking proactive measures to profit from them, or hedge existing portfolios from them.

A size up of historical time-series of option-implied volatility against realized volatility (using a rolling time-span comparable to option term to expiry) on an equity index shows options to be overpriced more often than not. This persistent overestimation has long since been identified and acted upon and selling overpriced option volatility is by far the most popular trading activity across the major asset classes within Liquid Alternatives.

Aside from protecting equity investment portfolios as a hedge, harvesting equity index option premia through successful short volatility trades offers numerous applications from beta enhancement with covered call writing, to long/short implementation, as well as portable alpha and options overlays. There are many ways volatility can be sold, the most popular ones being options and volatility index futures. There exist other less popular means like variance swaps that compromise on liquidity.

Gamma Yield is one approach among many cited above, to selling volatility. Foremost among features that distinguish it from others is, the strategy sells equity index options on expiration day only and as such, they are intraday trades. The strategy takes advantage of the unique characteristics of at-the-money (ATM) or near-ATM option greeks on expiration day. The strategy is guided by signals from the Hercules Index Trend Reversal Strategy (ITRS)[1] on intraday price levels. The strategy is implemented in a controlled manner using several risk mitigation measures.

The Gamma Yield Concept – Harvesting Volatility Premium in Equity Market Indices as Underwriting Hazard Insurance

Volatility is a standardized measure of uncertainty in the future performance of any unstable and randomly changing system. Equity index options put a price (or risk premium) on this measure (over a future time period) that parties in a transaction can agree upon. Rising expected volatility reflects a higher likelihood of a larger market move. Therefore, there is a greater desire for insurance, resulting in higher option prices. Lastly, drops in an equity index tend to be steeper and faster relative to rises and result in a higher measure of realized volatility over the duration of the drop.

In this context, an investor with a long position in a stock index has full risk exposure to the uncertainty in future price movements of the index. The investor may want to buy insurance protection against market downside risk on this long position. Buying options referencing the index would achieve this objective of buying downside protection insurance, effectively reducing or hedging his overall risk exposure. As with buying insurance, the cost of protection is usually greater than the expected loss. Actuarial science ensures, such is the outcome on average. Yet investors are compelled to buy this protection either as a strategic or tactical risk control measure or for regulatory reasons.

1, Research Note: The Hercules investments Index Trend Reversal Strategy (ITRS)

Purchasers of insurance generally expect to lose money on their purchase, but are comforted by the protection against a catastrophic loss and investors are no different as they look to hedge against unexpected adverse event risk including tail risk events.

Apart from this organic tendency for option activity to be driven by index option buying, there are other fundamental reasons driving this bias.

Forecasting adverse events is an inexact science and it is reasonable to expect a premium built in for uncertainty around expectations. Option selling generally incurs the highest cost of capital among trades involving options with participants incurring different capital requirement levels. This variability adds to the option premium demanded by sellers. While hedges (via option purchase) are applied to reduce overall risk, taking the other side of the trade is typically speculative unless the option selling is meant to hedge a short exposure in the index. The opportunistic nature of the short option trade again biases it in favor of a premium surcharge.

Pioneering work[2] in the field of behavioral psychology and economics by Amos Tversky and Daniel Kahneman showed that loss aversion is a more powerful motivating factor than gain satisfaction. Investors are regularly driven by their fear of loss, often making decisions that are far less rational than would otherwise be expected. It therefore comes as no surprise that in options markets, investor demand for protection usually increases in the wake of crisis prompting option premia associated with this protection to also rise above theoretical fair value.

On the flip side, when things look calm, investor complacency leads to a drop in demand for insurance. It is during these periods of relatively low volatility that such insurance is both plentiful and cheap. Thus, the demand for protection is counterintuitive as the options markets systematically overprice insurance premia in a crisis and vice versa. This paradoxical yoyo effect in observed market premia versus corresponding theoreticals, despite the fact that most options expire worthless, gives a statistical edge to option sellers.

Demonstrating the Efficacy of Systematically Selling Volatility

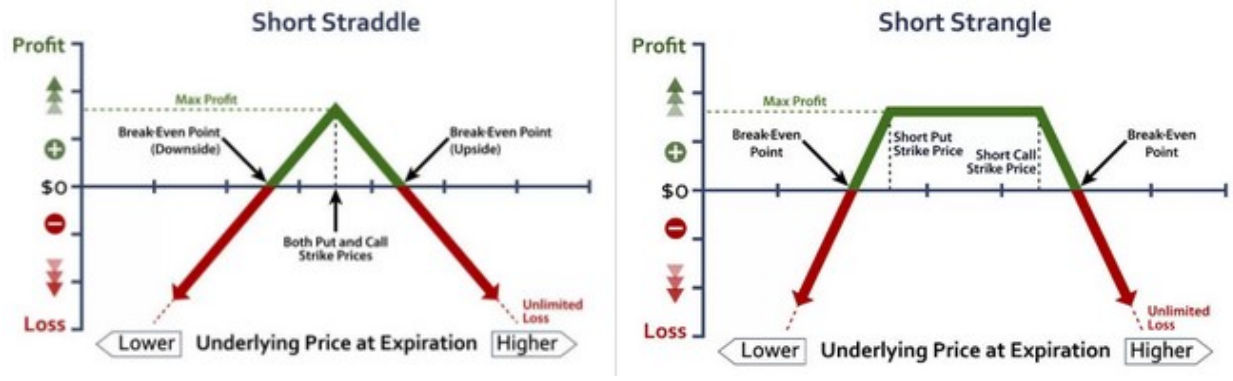
The implied volatility in the price of an equity index option is the market's expectation of what the future volatility of the equity index will be, on average, over the remaining time period until the option expires. Realized volatility is what the actual volatility of the equity index turns out to be. For reasons cited above, historically there has been a persistent spread between implied and realized volatility and, more often, the anticipated level of what volatility will be, is higher than where actual volatility is eventually priced.

The performance of an option is driven by the directional movement in the price of the underlying asset and changes in the volatility risk premium due to price changes. An investor can remove the directional bet component and retain only the volatility premium content by buying and selling options around the current market price of the underlying asset.

Using equity index options to sell volatility involves being short both puts and calls on the same underlying index. A short straddle, which combines a short put and a short call of equal strike price, maturity, and size, is one of the most basic approaches an investor can use. Another example is a short strangle, or simultaneously selling both out of the money puts and calls with the same maturity and size.

A static method of systematic implementation involves initiating sells of both legs together and then rolling the contracts over together before expiration.

Figure 1. Short Straddle and Short Strangle Payoff at Expiration



2. "Prospect Theory: An Analysis of Decisions Under Risk," Amos Tversky and Daniel Kahneman, 1979.

A study published by Cambridge Associates in March 2011[3] shows that over a period spanning 20 years, implied volatility has been higher than realized volatility in 86.9% of monthly observations, with a mean difference of 4.5%. Our research confirms the same over a more recent time period.

The Hercules Investments Gamma Yield Strategy – Description

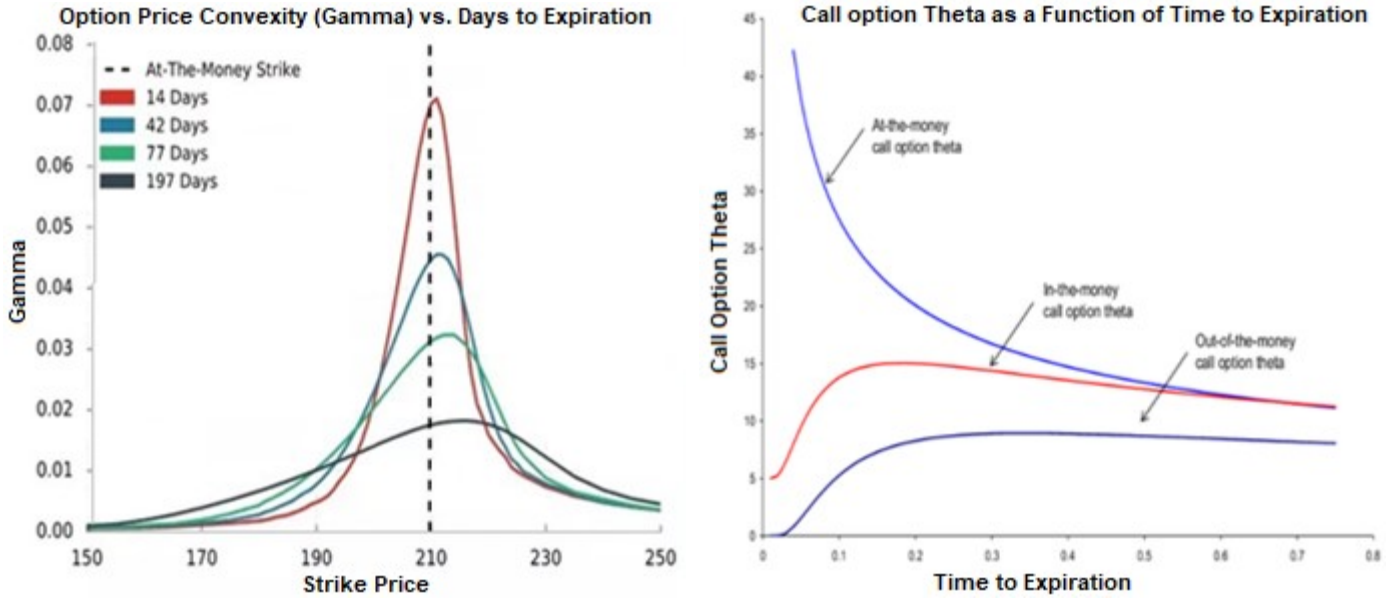
Gamma Yield is a very short-term (intraday) options strategy for periodic premium collection by opportunistic writing of call and put contracts on the mainstream US (spot) cash equity indices. It specifically focuses on the unique risk characteristics of options on their day of expiration. The strategy looks to extract the non-intrinsic value remaining in the option price as the time value of the option approaches zero. The strategy is guided by very short-term trading signals from the Hercules Investments Index Trend Reversal Strategy (ITRS) model-set. The strategy restricts itself to the use of equity index options in taking aggregate market risk exposure.

The strategy sells out-of-the-money (OTM) options with strikes in the vicinity of the current price of the referenced index (near-ATM) at any time during the 6.5 hours of trading on the day of expiration of the options with the objective of letting the positions expire at the close of options trading for the day. The trades, based on input from the ITRS model, may be configured in the following manner:

1. Sell an OTM Call option and an OTM Put option of the same notional value and preferably the same option delta to effectively create a Short Strangle position. A delta-neutral setup ensures the return performance is direction agnostic in the locality of the current index price. Therefore any trade profit will result largely from declining values of the options premia (as time ticks towards expiration) and not so much from changing intrinsic value of the options, as they net out. This decline in time value accelerates as the time to expiration draws to a close. The trade benefits from the certainty of zero remaining option time value at expiration at which time, the net intrinsic values of the two option legs determine trade P/L

   The portion of option premium owed to option price convexity, is at its peak at or close to the option strike and the short option position P/L also benefits from any index price movement away from ATM, due to plunging gamma. The relationship is elaborated below.

Figure 2. Option Price Convexity and Time Value as Functions of Time to Maturity



2. The trade may also be optionally implemented using a single leg coupled with a loss limit exit order. The leg may be implemented either with a short Call or a short Put option. This is not a pure-play trade on option price convexity as the trade has directional or delta exposure in addition. This exposure sets up the potential for asymmetric loss unless restricted and a stop loss order is typically implemented as a loss mitigation measure. This is explained later in the section on risk management.

3. "The Benefits of Selling Volatility," E. Winig, K. Tongberg and A. Jones, Cambridge Associates, 1991.

There are reasons the strategy uses options with strike prices in the proximity of the underlying index price at the time of the trade. For an At-The-Money (ATM) option:

- Gamma, or the non-linearity of price change, (a measure of price acceleration,) rises exponentially upwards, & is at its maximum on the day (and in the hours) leading up to option expiration. In other words, as the option gets closer to expiry, the probability of option payoff gets tighter and tighter around its current price and when the option is ATM, the discreteness of a zero versus non-zero outcome gets closer to being binary. This growing tendency towards a vastly different or 0/1 outcome when an option is ATM heading to expiry, is captured by gamma, the price convexity measure and its relationships to option strike and time to expiry in the diagrams above
- Option gamma rapidly falls off as we move away from ATM, either toward moneyness or away from it. It is because the likelihood of an OTM option ending in-the-money (ITM) gets more remote as the option moves further out of the money. Conversely, the probability of an ITM option expiring worthless gets more remote as the option gets further ITM.
- Option theta, or time value left in the option, decays faster as the option gets closer to expiration. This decay is at is at its maximum on the day (and in the hours) leading up to option expiration
- Option theta is lower, away from ATM and therefore theta decay is not as steep, away from ATM

In consolidating these separate observations, the summary takeaway is that at any given time, the non-intrinsic option premium across all options with a common expiry date will be at its maximum for the ATM (or nearest to ATM) option (assuming they are priced to a normal distribution.) If the pricing is non-normal to incorporate a market bias up or down, maximum premium will be found in the option close to, but not necessarily ATM or nearest. This rationale guides us to implement option strikes closer to current index price levels.

There is a countervailing reason that sets up a tradeoff in deciding on the strike price of an option. [If the index price moves in the direction of the option strike in the time remaining to expiry, the short option position loses value. After the index price crosses the strike to the point of offsetting the option premium, the option is worthless at the time. Any further index price movement along the original direction creates an increasingly losing position.] The Short Strangle configuration described above creates a narrow price band within which profitability can be realized in the time remaining, as the up-front option premia collected on both legs are preserved. Any movement in index price outside the payoff bounds shown in figure 1, results in the current net market value of the options eroding the premia and eventually accumulating a net loss in the position. Therefore the reach to collect premia should be tempered with the prudence to create a margin of safety and allow the trade to be profitable.

The prospect of loss making scenarios is real and addressed through the use of stop orders to both legs that effectively close the trade. Technical signals from our ITRS model provide intelligence in choosing option strikes and loss limit bounds to successfully navigate the trade to expiry.

Input from ITRS Model Signals as Guidance for the Strategy

The Gamma Yield strategy leverages the Index Trend Reversal Strategy (ITRS) in identifying trade opportunities and ranges. The ITRS model prompts intraday and weekly trend reversals when predetermined support, resistance and retrace (S/R/R) pivot levels are realized on the S&P 500, RUSSELL 2000 and NASDAQ 100.

While it cannot be determined exactly at what price a reversal will occur, patterns of historical reversals give us clues that guide our approximation by deploying a tactical methodology utilizing pivots and support and resistance levels.

The model banks on the indices experiencing an overbought or oversold condition every 5-7 days during 75% of all trading days. The overbought and oversold conditions occur at “pivots” which we identify as “Support”, “Resistance”, and “Retrace”. With Retrace being a failed breach of 50% of the midpoint from the previous 5-7 day high or low.

The ITRS assumes that more than 85% of the time, the index will reverse direction by a minimum of 1% when it encounters support or resistance at calculable pivots. In addition, the ITRS assumes that more than 61% of the time, the index will reverse direction by a minimum of 0.5% when it encounters support or resistance at the 50% retracement level from the previous 5-7 day trend.

The guideposts provided by ITRS allow for better risk control of Gamma Yield trades and the potential to trade more profitably and consistently.

Tools and Indicators as Additional Inputs in determining Support, Resistance and Retracement Levels

We utilize several leading indicators to aid in the determination of trend reversals in equity indices. They include but are not limited to:

- Advance/Decline ratio (net change %)
- Divergence, trend line break and 123 reversal pattern
- VIX
- 5-7-day advance or decline on major indices
- Greater than 2% advance on indices within 2 sessions

Identification of trend reversals are also subject to several known risk factors They are typically discrete event driven with some examples being Fed Announcements, ISM, CPI/PPI, Earnings, breach of pivot and false signals.

An Example Gamma Yield Trade

Figure 3: Profitability of a Short Strangle Trade (Short OTM Call + Short OTM Put)

In the example trade in figure 3 above, the S&P 500 ETF is shown at a current level of $291.46 on 8.23.2019. A Short Strangle trade is implemented in the morning of 8.23 with OTM call and put options with strikes of 300 and 280 expiring on the same day. The theoretical P/L of the short straddle is shown to be $19.57 by the option pricing model as the theoretical likelihood of the SPY index exceeding the positive payoff bounds of the trade are appreciable owing to the time remaining till expiry. The probability of realizing a maximum profit in the scenarios the index is within options bounds as they expire is shown to be 59.32% while the probability of any profit (allowing for some option premium to be eroded, is 63.4%. With the passage of time, this percentage rises as long as the index remains within options strike bounds and is reflected in rising theoretical P/L. If the index remains within bounds at options expiry, the realized P/L is $108.

In contrast, the probability of realizing a non-zero loss when the SPY index exceeds options bounds is 36.6% with this percentage being apportioned based on the index drift exceeding the left bound versus the right one.

As mentioned earlier, we attempt to improve upon the odds of a favorable outcome with input from the ITRS model.

Risk Management

As with any option selling strategy, the risk here is large on an absolute basis as well as in comparison to a long option strategy. Straddles have contained downside because of the netting effect among the two legs of the trade. However, the potential downside in a standalone short put position is higher and with a short call, it is theoretically infinite. Therefore it becomes imperative to apply a disciplined loss-limit management in place with exit stops as a primary safety measure.

Each trade is set with a maximum downside limit on holdings and the position is closed when that threshold is crossed. A stop loss program will determine the maximum loss-tolerance for the investor and automatically sell holdings to prevent such a loss. The stop loss program also implements a 'trailing-stop' approach which will 'protect' gains by selling holdings if markets begin to retreat from recent advances. The value of the trailing stop program is that the investor can benefit from gains when markets rise and retain those gains if the uptrend ceases or reverses.

In addition to systematic trade signal generation and trade execution, the strategy adopts a systematic budgeting of portfolio risk capital, wherein the trade may be legged into incrementally. Restraining the trade horizon to an intraday limit and restricting the use of options to expiration day-only are additional risk mitigation measures that also improve the odds of a favorable outcome.

Conclusion

Systematically selling volatility can deliver unique excess return streams that compare favorably with broad equity index returns, while having low correlation to these indices. The key factors influencing the success of such a strategy are that it be both rules-based and systematic. Further, managers employing such a strategy must be disciplined, especially with respect to the use of leverage, and need to employ the proper systems to monitor risk in real time. Given the inherent structural underpinnings of the volatility market, we believe it is possible to implement a rules-based and systematic strategy to achieve the type of results that our research suggests, regardless of market environment. We believe the short volatility strategy stands to consistently generate returns by capturing the spread between implied and realized volatility, with low volatility, and limited correlation to most other investments and deserves consideration as a portfolio allocation.

Each trade extracts a modest profit out of the market, and when applied consistently, pure alpha generated from gamma yield trading adds up. Because of their short duration trades, the gamma yield strategy tends to have low correlations to other liquid alternatives strategies as well as traditional asset classes. The strategy tends to be prolific in generating alpha during periods of higher market volatility when options premia are overpriced due to outsized demand. As such, it is considered valuable in helping offset drawdowns from other allocations in an overall portfolio mix.

Selling volatility is not without risk and therefore suitable for investors seeking aggressive growth. Selling options is also capital intensive in comparison to long option strategies. However when systematically managed, the differentiated return stream confirms its utility.

In summary, the Gamma Yield strategy is a valuable strategy that is well differentiated from others that make up the Hercules Investments Systematic Volatility group of strategies. Its return stream bears all the characteristics to qualify as a differentiated standalone strategy, as well as a unique component to any overall portfolio investment allocation.

Please visit our website at https://www.hercules-investments.com and reach out to one of our investment advisors at 800-729-0417 or corporate@hercules-investments.com.
