



# Hedging Equity Volatility with VIX-Based Instruments

Nick Cherney and William Lloyd

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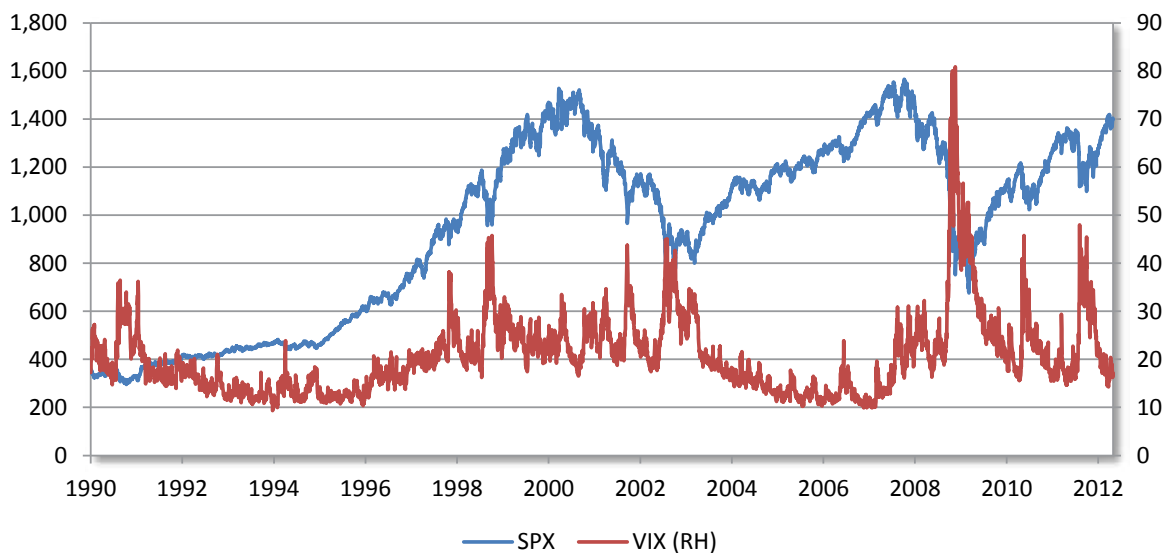
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## HEDGING EQUITY VOLATILITY WITH VIX-BASED INSTRUMENTS

Diversification proved to be a relatively ineffective hedge against 2008’s stock market crash, and since that realization almost five years ago, investors have been searching for an efficient means to insulate equity portfolios from a repeat performance. One asset class that performed well in the face of the crash was volatility—the stock market plummeted in September 2008 and the CBOE Volatility Index (the VIX), soared (see Figure 1). The S&P 500 fell by 47 percent from its September 2008 peak to its trough in March 2009. During that same period, the VIX rallied 126 percent and at one point was up over 250 percent since the September high on the S&P 500. This negative correlation to the S&P 500 led many investors to investigate the VIX as a potential way to protect their portfolios from another collapse. Perhaps VIX, the so-called fear index, would enable managers to develop the portfolio hedge that investors had been seeking.

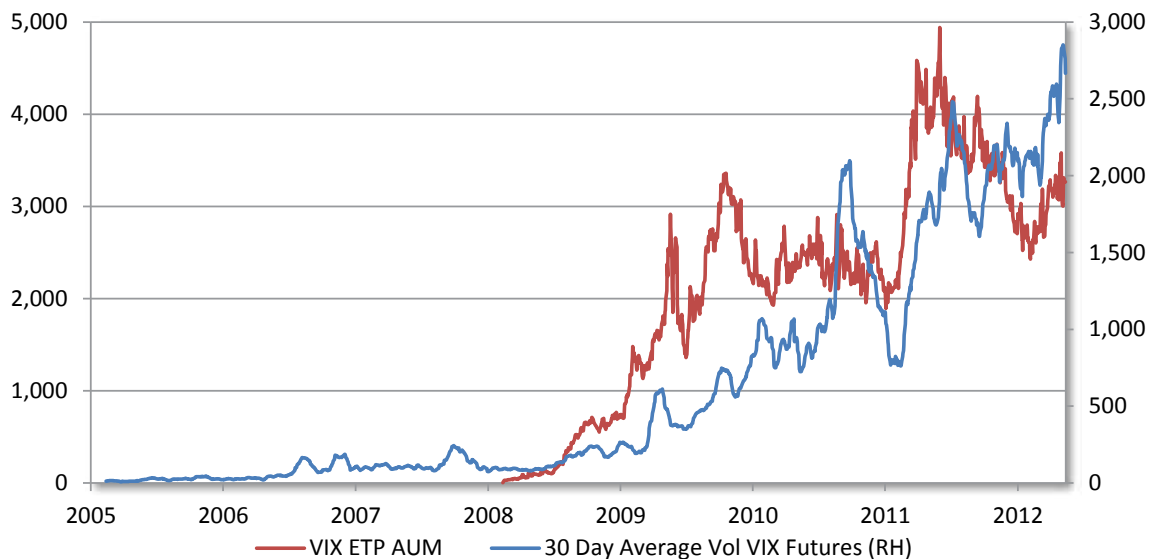
FIGURE 1: PERFORMANCE OF S&P 500 AND THE VIX



Sources: VelocityShares, Bloomberg; January 1990-April 2013

The VIX was introduced in 1993, but it wasn’t until 2004, when futures were first listed, that investors could take positions in exchange-traded VIX instruments. Trading in VIX futures accelerated dramatically after the launch of VIX-related exchange-traded products in early 2009. As shown in Figure 2, the 30-day average trading volume in VIX futures has increased almost twentyfold since the advent of VIX ETPs. It took less than four years for VIX-related ETPs to grow from zero to more than \$4 billion.

FIGURE 2: VIX FUTURES TRADING VOLUME AND VIX ETP AUM (\$MM)



Based on daily returns; Sources: VelocityShares, Bloomberg; December 2005 – April 2013

Before looking at specific strategies or asset allocation concepts, it is important to understand the construction of the underlying volatility benchmarks and indices. The VIX index and instruments related to the index have performance characteristics that differ from other futures-based instruments.

### THE FEAR INDEX

The VIX<sup>1</sup> is a measure of the volatility implied by prices of S&P 500 options for the next two expiries. The option expiries are weighted such that the index measures the 30-day expected volatility of the S&P 500. The components of the VIX are near-term and next-near-term put and call options having at least eight days until expiry, and the square root of the variance of these options is used to calculate the index. As volatility rises and falls, the strike price range of options with non-zero bids tends to expand and contract. As a result, the number of options used in the VIX calculation may vary from month-to-month, day-to-day and possibly even minute-to-minute. It is the use of the square root in the index calculation and the potential for change in the components of the index that make it unrealistic to actually trade the index. The VIX is widely followed by the market and the media, but it is not an investable index.

FIGURE 3: PERFORMANCE STATISTICS (%)

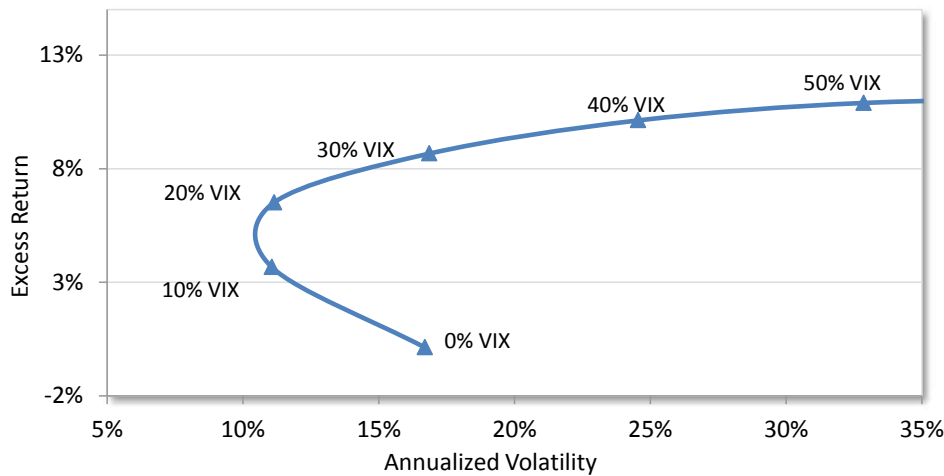
Index	VIX	S&P 500
Minimum	-29.57	-9.03
Maximum	64.22	11.58
Median	-0.31	0.05
Mean	0.19	0.03

Sources: VelocityShares, Bloomberg Statistics based on daily returns; January 1990-April 2013

The negative correlation of the VIX to the S&P 500 would make it an attractive addition to a portfolio. Figure 4 demonstrates that adding a holding in the VIX to a holding in SPX improves the risk-adjusted return.

<sup>1</sup> <http://www.cboe.com/micro/VIX/vixwhite.pdf>

FIGURE 4: SPX/VIX EXCESS RETURN VS. VOLATILITY <sup>2</sup>



Sources: VelocityShares, Bloomberg; December 2005-April 2013

Unfortunately, it is not possible to own the VIX. Investors can gain exposure to equity volatility by investing in futures and options on the VIX as well as ETPs linked to VIX futures indices, but each of these has specific performance characteristics that should be well understood before investing.

### INVESTABLE INSTRUMENTS

In 2004, CBOE introduced futures on the VIX. This gave market participants the ability to gain exposure to equity volatility in exchange-traded markets. One of the challenges with trading VIX futures is that they cannot be arbitrated. It is not possible to own spot VIX, and therefore if a trader believes the futures are mispriced relative to the spot price, it is not possible to buy spot and sell futures (or vice versa) to exploit mispricings. Unlike most futures markets, there is no direct linkage between the VIX and a given futures contract. So while the level of the futures contracts is theoretically an indicator of market expectations about future VIX levels, it is in fact dictated solely by supply and demand; there is no market mechanism to connect the futures and spot price. This means that there is the potential that the level of the futures does not accurately represent the market's expectation for future volatility.

This pricing dynamic leads directly to the single largest concern for investors looking to hedge their exposure to the equity market with VIX futures: the cost of implementing the hedge. The severe contango, or upward-sloping term structure, that generally exists in the VIX futures market makes the cost of buying and holding long positions in VIX futures prohibitively expensive. Since the introduction of VIX futures indices in 2005, the average contango from the first to second month nearby contracts has been 5.2%. This means that on average, VIX would have to rise by that amount per month for the holder of the contract to breakeven.

### S&P 500 VIX FUTURES INDICES

While the CBOE has been publishing the VIX since 1993, it wasn't until 2009 that an investable index emerged. Standard & Poor's launched a pair of VIX futures indices: the S&P 500 VIX Short-Term Futures Index (SPVXSP) and the S&P 500 VIX Mid-Term Futures Index (SPVXMP). The Short-Term Futures Index measures the return from daily rolling weighted long positions in the first- and second-month VIX futures contracts. The Mid-Term Futures Index measures the return from daily rolling weighted long positions in the fourth- through seventh-month VIX futures contracts. To maintain a constant average maturity, the weighting of the positions in the futures contracts rolls on each trading day. The specifics of the indices are presented in Figure 5.

<sup>2</sup> The graph assumes a monthly rebalance of positions to the target portfolio weights.

**FIGURE 5: VIX INDEX AND VIX FUTURES INDICES**

	VIX	SPVXSP	SPVXMP
Name	CBOE SPX Volatility Index	S&P 500 VIX Short-Term Futures Index	S&P 500 VIX Mid-Term Futures Index
Investable	No	Yes	Yes
Futures Contracts	N/A	1st & 2nd month	4th, 5th, 6th & 7th month
Average Maturity	N/A	1 month	5 months
Beta to Spot VIX	1.00	0.48	0.22
Correlation to Spot VIX	1.00	0.91	0.82
Correlation to SPX	-0.81	-0.81	-0.80

Sources: VelocityShares, Bloomberg; December 2005-April 2013

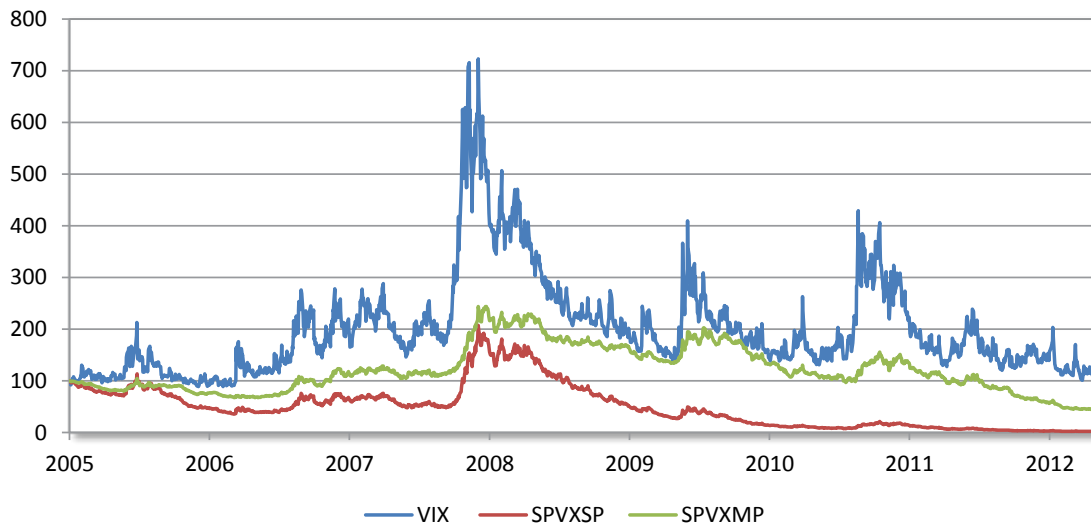
VIX futures can be an effective hedge for short holding periods, but the cost of hedging with VIX futures is very high: in four out of seven full years since the introduction of the VIX Short Term Futures Index, returns have been -50% or less.

### CONSEQUENCES OF CONTANGO IN THE VIX FUTURES MARKET

Since the launch of the first VIX-related ETPs in January 2009, the futures contracts underlying the VIX futures indices generally have been in contango. The contango in the futures market results in the index losing value every trading day if future prices do not move higher than discounted in the market—the value of the contracts is falling as they roll down the futures price curve. The 20-day rolling average spread between the first- and second-month futures contracts has averaged 5.6 percent per month since the inception of the VIX Short-Term Futures Index in 2005, but has averaged a much steeper 7.0 percent per month since the introduction of the VIX ETPs in January 2009. At the same time, the supply/demand dynamic for VIX futures changed dramatically.

Many futures markets are in contango from time-to-time, but the VIX futures market, has been in contango about 80% of the time since inception. A number of theories have been put forth as to why: One theory is that the introduction of VIX-related products created continued demand to buy the second month and sell the first month in line with the index. Another posits that after the 2008 stock market crash, investors were willing to pay a higher premium for longer-dated volatility exposure that would provide them “protection” from a sell-off in the equity market.

The contango in the VIX futures market has had a significant impact on the performance of the S&P VIX Futures Indices. The degree of this impact is most evident when looking at the relative performance of the Short- and Mid-Term indices. Figure 6 depicts the level of the Short-Term and Mid-Term indices since inception against the level of VIX. The VIX Short-Term Index has lost over 98% since inception, and 78% of its value in 2012. During those same periods, the Mid-Term index posted returns of -58% and -54%, respectively. While the two indices suffered significant double-digit negative returns in 2012, the VIX was down only 23% during the same period. This relative performance highlights the cost of a buy-and-hold exposure to the S&P 500 VIX Futures Index due to the contango in the futures market.

**FIGURE 6: VIX, VIX SHORT-TERM AND MID-TERM FUTURES INDICES**


Sources: VelocityShares, Bloomberg; December 2005-April 2013

Clearly, the S&P 500 VIX Short-Term Futures Index is not the same as the VIX. Since the index's inception in December 2005 through April 2013, the daily return of the short-term VIX futures index has a beta of about 0.5 with spot VIX, and the beta on the Mid-Term Futures Index is approximately 0.2.

As many market participants have learned the hard way, it is expensive to buy-and-hold a long only position in VIX futures, options or exchange-traded products. Simply looking at the return of the index makes that painfully clear. The return on the indices, especially the Short-Term Index, has trended down since inception. The relative performance of the indices is even clearer when looking at the numbers (see Figure 7).

**FIGURE 7: ANNUAL INDEX PERFORMANCE (%)**

	VIX	Short-Term Futures	Medium-Term Futures
2006	-4	-53	-22
2007	95	37	47
2008	78	123	81
2009	-46	-65	-24
2010	-18	-72	-13
2011	32	-4	-8
2012	-23	-78	-53

Sources: VelocityShares, Bloomberg

The VIX Short-Term and Mid-Term Futures Indices are the reference indices for almost all of the 18 outstanding VIX-related ETPs. Some are leveraged, periodically resetting and/or comprise a combination of indices. It is important to understand how the index underlying the ETP behaves under different market conditions, and equally important to understand the instrument. One area that has received a great deal of attention is the performance of leveraged and inverse products that reset daily, and that is particularly interesting in the context of VIX futures indices.

## DAILY RESETTING LEVERAGED AND INVERSE PRODUCTS

Daily resetting leveraged and inverse products have return characteristics that may not be immediately apparent to many investors. These instruments seek to replicate the performance of a leveraged or inverse position in an underlying index for a one-day holding period. In general, these types of instruments are suited for professional traders who are interested in using them to express specific short-term market views or manage portfolio risk. They are not intended for buy-and-hold investors.

In most cases, the performance of a daily rebalancing leveraged or inverse instrument held for more than one day will be different than a similar instrument that is not rebalanced. In fact, for holding periods longer than a day, it is possible for leveraged/inverse products to perform in the opposite direction than would be expected given the performance of the underlying index. For example, the underlying index could have a positive return, while the leveraged instrument could have a negative return. This is especially true in choppy markets. This loss of value resulting from daily resetting is frequently referred to as “decay.”

Daily resetting leveraged and inverse exposures exhibit positive convexity over time: the returns of the instrument increase more rapidly and decrease less rapidly than an equivalent linear exposure. In certain scenarios, daily resetting could work in favor of the trader. For example, if the underlying index consistently moves in one direction then, as shown in Figure 8 Exhibit 1A, the daily resetting instrument outperforms the non-resetting instrument. Therefore in a trending market, the daily resetting leveraged instrument should outperform the non-resetting leveraged position. This relationship holds regardless of the direction of the underlying market and is a result of the positive convexity of daily rebalanced instruments.

**FIGURE 8: A 2X LEVERAGED PRODUCT: COMPARISON OF THE EFFECT OF DAILY REBALANCING**

**Exhibit 1A: Three Consecutive Upward Moves**

Day	Underlying Price			Daily Rebalanced		Not Rebalanced	
	Begin	End	Return	1-day Return	Cumulative	1-day Return	Cumulative
1	100	110	10.0%	20.0%	20.0%	20.0%	20.0%
2	110	121	10.0%	20.0%	44.0%	18.3%	42.0%
3	121	133.1	10.0%	20.0%	72.8%	17.0%	66.20%

Source: VelocityShares

**Exhibit 1B: Volatile Underlying Leads to Decay**

Day	Underlying Price			Daily Rebalanced		Not Rebalanced	
	Begin	End	Return	1-day Return	Cumulative	1-day Return	Cumulative
1	100	110	10.0%	20.0%	20.0%	20.0%	20.0%
2	110	99	-10.0%	-20.0%	-4.0%	-18.3%	-2.0%
3	99	100	1.0%	2.0%	-2.1%	2.0%	0.0%

Source: VelocityShares

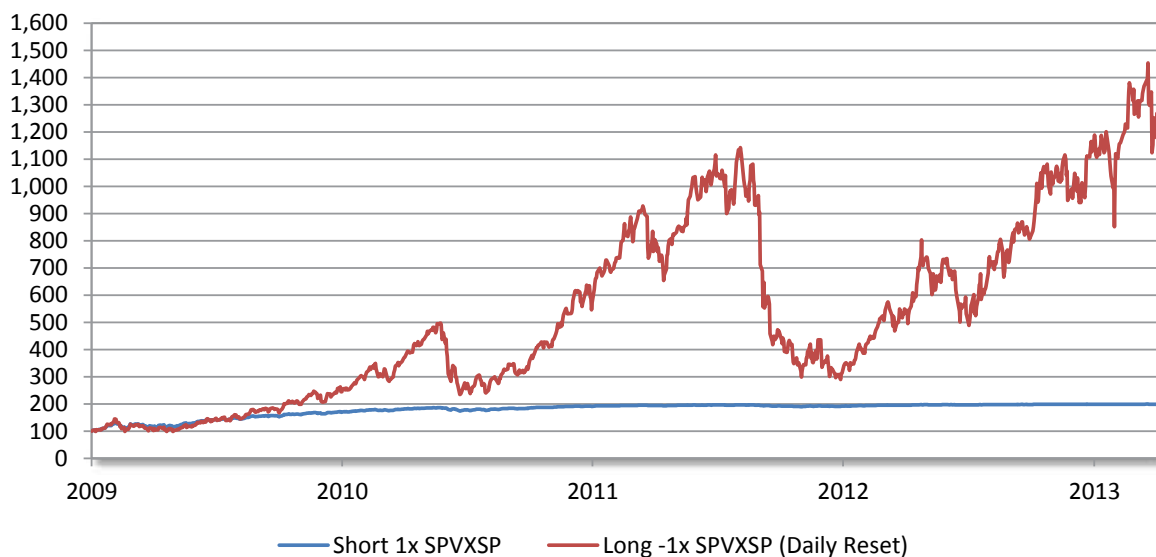


### PATH OF UNDERLYING PRICE CHANGES

In addition to demonstrating the effects of the length of the holding period on returns, the examples above also highlight that the return on the daily rebalanced instrument is dependent on the path of the changes in the price of the underlying index. In Exhibit 1B, the price of the underlying instrument at the end of the third day is the same as the price at the beginning of the first day. Therefore one might conclude that there would be no change in the value of the daily rebalanced leveraged instrument over that time period, but, as the analysis shows, the return on the daily rebalanced 2x leveraged instrument generated a loss of 2.1 percent. The decay is a result of the level rising significantly and then falling significantly. Clearly, a trader who did not understand the effects of daily rebalancing would not have expected that outcome.

Figure 9 compares the return of a daily resetting inverse position in the VIX Short-Term Futures Index with a non-daily resetting inverse position (i.e. a short position) in the index. The outperformance of the daily resetting index is significant. During the 52-month holding period, the daily resetting position returned 1,167 percent vs. 99 percent for the non-resetting position. This is due to a combination of factors, including the convexity of daily resetting products, and that effective exposure of the non-resetting position declines as the level of the index falls—as the trade moves in the desired direction, the effective leverage declines.

**FIGURE 9: PERFORMANCE OF DAILY RESETTING INVERSE AND SHORT INDEX POSITION**



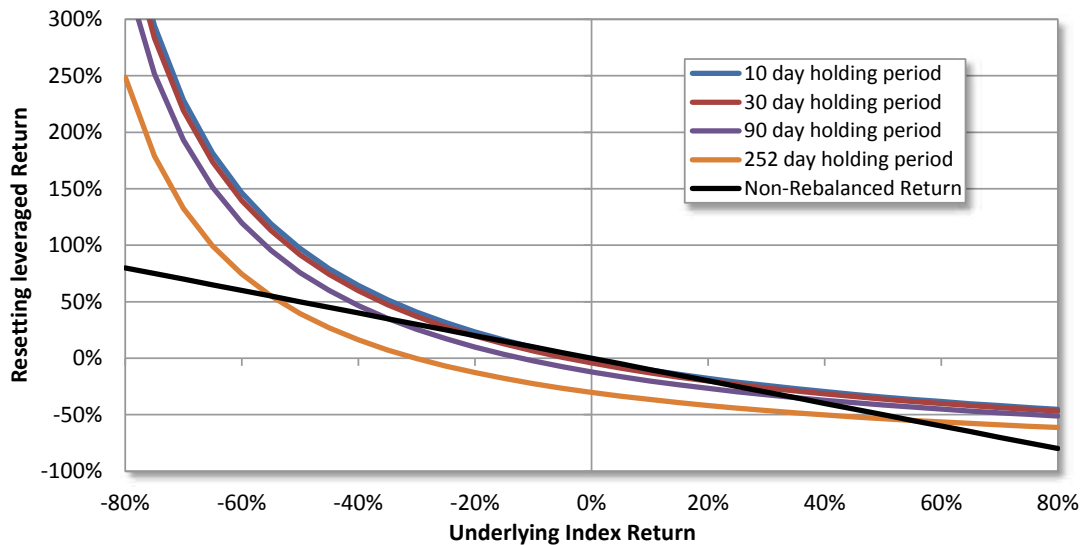
Source: VelocityShares, Bloomberg; December 2008-April 2013

A closed-end formula can be used to calculate the expected return on a daily resetting instrument relative to an underlying index based on three inputs: 1) the return of the underlying index, 2) the volatility of the underlying index, and 3) the holding period.<sup>3</sup> The analysis assumes a normal distribution of returns for the underlying index (which, as discussed later, the VIX Futures indices are not).

<sup>3</sup> "The Dynamics of Leveraged and Inverse Exchange-Traded Funds," Cheng and Madhavan, 2009

Figure 10 shows the return of an inverse, daily resetting product, and assumes a 60 percent annualized volatility, which is about the average volatility of the VIX short-term index since 2005.

**FIGURE 10: EXPECTED TOTAL RETURNS OF AN INVERSE DAILY RESETTING PRODUCT**



Source: VelocityShares

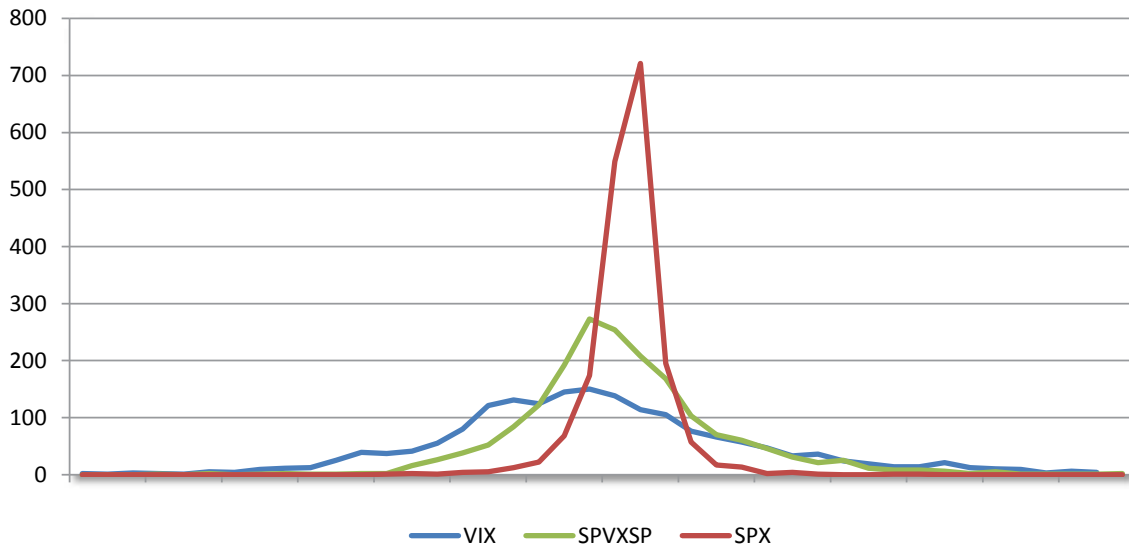
As demonstrated in Figure 10, the longer the holding period, the more likely that the daily resetting product will underperform the underlying index. For example, for a 10-day holding period, the daily resetting product is expected to outperform the underlying index if the underlying index’s performance is less than –10 percent or is greater than 10 percent. The 252-day holding period requires approximately a +/-55% move in the underlying index. The larger the move down or up, the higher the expected product’s outperformance will be relative to the underlying index. The “cost” of the position is determined by the expected decay of a resetting position.

To summarize, while daily resetting products exhibit positive convexity, they also exhibit return decay in many return environments. Therefore, a stand-alone position in a daily-resetting product should only be initiated in place of a non-resetting position if the trader expects the positive effects of the convexity to outweigh the negative effects of the return decay for the period.

### NON-NORMAL RETURNS IN VIX FUTURES

The expected return analysis above assumes a normal distribution of returns. This assumption does not hold for VIX futures indices. The VIX-related ETPs are linked to the VIX futures indices (not the VIX), and the returns of the indices exhibit two non-normal characteristics: 1) a negative mean and 2) positive skew. As shown below in Figures 11 and 12, the returns of the S&P 500 Short-Term VIX Futures Index have a non-normal distribution.

**FIGURE 11: DISTRIBUTION OF DAILY RETURNS**



Sources: VelocityShares, Bloomberg; December 2005 – April 2013

**FIGURE 12: DAILY RETURN DISTRIBUTION STATISTICS %**

	VIX	SPX	SPVXSP
Minimum	-29.57	-9.03	-18.85
Maximum	64.22	11.58	24.53
Median	-0.57	0.08	-0.61
Mean	0.27	0.02	-0.14

Sources: VelocityShares, Bloomberg; December 2005 – April 2013

## DEVELOPING A VOLATILITY STRATEGY

The dismal performance of the S&P 500 VIX Short-Term Futures Index since its inception relative to the VIX coupled with the upward sloping shape of the VIX futures curve (contango) make it look attractive to be “short” the VIX Short-Term Futures Index. That said, there is a significant risk to being short volatility. While a daily resetting position in the inverse of the Short-Term Index has produced a total return of 793% from January 2009 (inception) through January 2013, there have been periods when the inverse of the index sustained large losses, i.e., October 2008, when the inverse position would have lost 59 percent. There are a number of strategies a manager can employ to mitigate the exposure to a spike in volatility, such as buying out-of-the-money calls or taking a leveraged long exposure to VIX-related instruments.

One technique that can be used to mitigate the risk of spikes in VIX to a short volatility strategy is to add a leveraged long position in the VIX Short Term Futures Index. At first blush, it may seem odd to combine a long position with an inverse position on the same index, but there are a number of reasons specific to daily resetting instruments and the VIX Short Term Futures Index that make this strategy interesting:

- Daily resetting exposures have positive convexity
- The VIX Short-Term Futures Index has a negative mean
- Index returns are not normally distributed

The positive convexity of daily resetting instruments and the non-normal distribution of the VIX Short Term Futures Index result in performance characteristics that may not be readily apparent. A simple example is useful to more clearly explain why the combination performs as it does. A portfolio consisting of notionally equally weighted holdings of a 2x leveraged long position and a short position in the VIX Short-Term Futures Index would have a neutral position in the index on day 1—the value of the combined holding should be unchanged at the end of the day. On day 2, because of the resetting of the two positions, the strategy would no longer be neutral to the VIX Short-Term Futures Index. An increase in the index would result in the portfolio having a net long position to the index, and a decrease in the VIX Short-Term Futures Index would result in a net short position.

Rebalancing each of the underlying positions at the end of the day would result in a change in the weighting of the overall portfolio—since the exposure of each position resets, the net exposure responds in a nonlinear fashion, and the net exposure tends to be long as the index increases, and short as the index decreases. To be clear, it is the individual positions in the index that are reset every day, not weightings in the portfolio.

The concept behind the strategy is that the holding in the inverse position enables the investor to benefit from negative roll yield (contango in the futures market) in most market conditions, while the long position enables the strategy to profit from a spike in volatility. The cost of the position is the expected decay.

## VELOCITYSHARES INDICES

The Volatility Components of the VelocityShares Hedged Large Cap Indices<sup>4</sup> were launched in April 2012. These indices capture the concepts discussed in the section above. The series includes the following two indices:

Long Name	Short Name	RIC	Description
VelocityShares Tail Risk Hedged Vol Component Index	TailrskHdgeVol	.TRSKVOL	The Index targets a long vol allocation (45% 2X Long / 55% -1X Short)
VelocityShares Volatility Hedged Vol Component Index	Volhdgevol	.SPXHVOL	The Index targets a vol neutral allocation (33% 2X Long / 67% -1X Short)

Both volatility indices are designed to provide long/short exposure to VIX futures and to benefit from the interaction between the dynamics of the VIX futures curve and the convexity generated by using daily resetting instruments. They utilize a purely systematic, signals-free approach, in an attempt to create effective volatility positions with desirable cost/benefit characteristics.

The indices are designed to be replicable – an investor holding all of the reference securities at the same weights and adjusted daily should realize returns similar to that of the index.

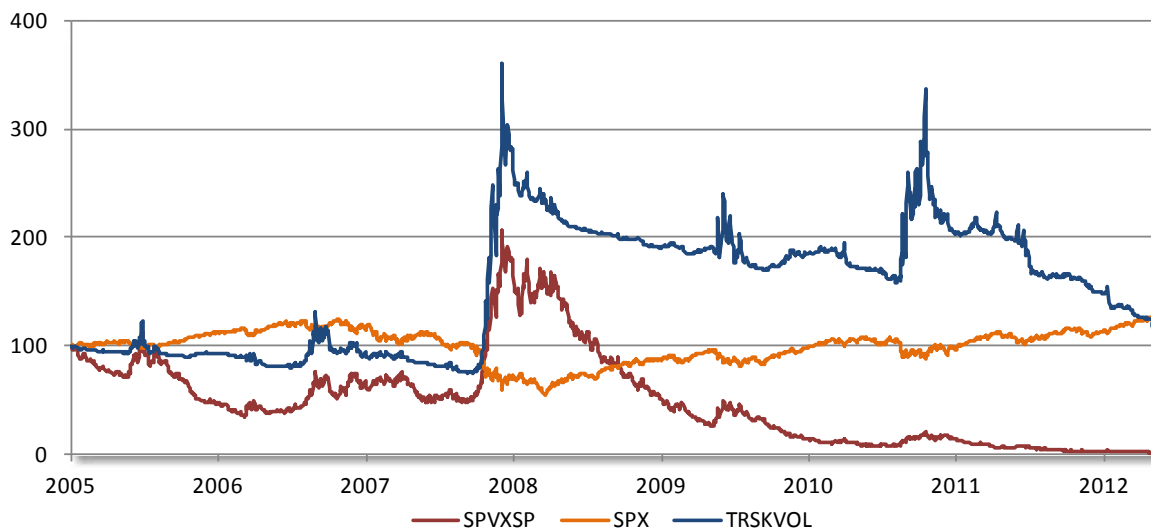
The two reference securities underlying the volatility indices are US-listed exchange traded products (ETPs), one reflecting a position in an ETP (UVXY) with a two-times (2X) leveraged exposure to the VIX Short Term Futures Index and the other reflecting a position in an ETP (SVXY) with an inverse (-1X) exposure to the same VIX Short Term Futures Index.

<sup>4</sup> Each index seeks to gain exposure to a specific volatility strategy by taking advantage of the convex return profile of a series which is rebalanced daily. This convex profile, combined with the negative mean and positive skew of the VIX Short Term Futures Index returns, enables a payoff profile with risk return characteristics that can be tailored to specific investor needs. This is accomplished by pairing both long and short positions (each rebalanced daily) in VIX Futures. The target ratio of long and short exposure is different for each index and is rebalanced to target weights on a quarterly basis. In order to reduce the path-dependent nature of such an exposure, the index tracks 13 sub-portfolios, each of which allocates between a leveraged and inverse exposure to VIX futures indices. Each sub-portfolio is rebalanced back to its target weight independently and quarterly, with rebalancing dates spread evenly in a quarter on a weekly basis. Each strategy then simulates the return of owning the 13 sub-portfolios on an equally weighted basis, with a quarterly rebalancing back to equal weight.

### TAIL RISK HEDGED INDEX (TRSKVOL)

VelocityShares Tail Risk Hedged Vol Component Index (Tail Risk Index) represents a combination of a target 45% 2x leveraged long exposure and a 55% short exposure to the VIX Short-Term Futures Index. It can result in an attractive tail risk hedge to the S&P 500 (see Figure 13).

FIGURE 13: TAIL RISK HEDGED INDEX\*



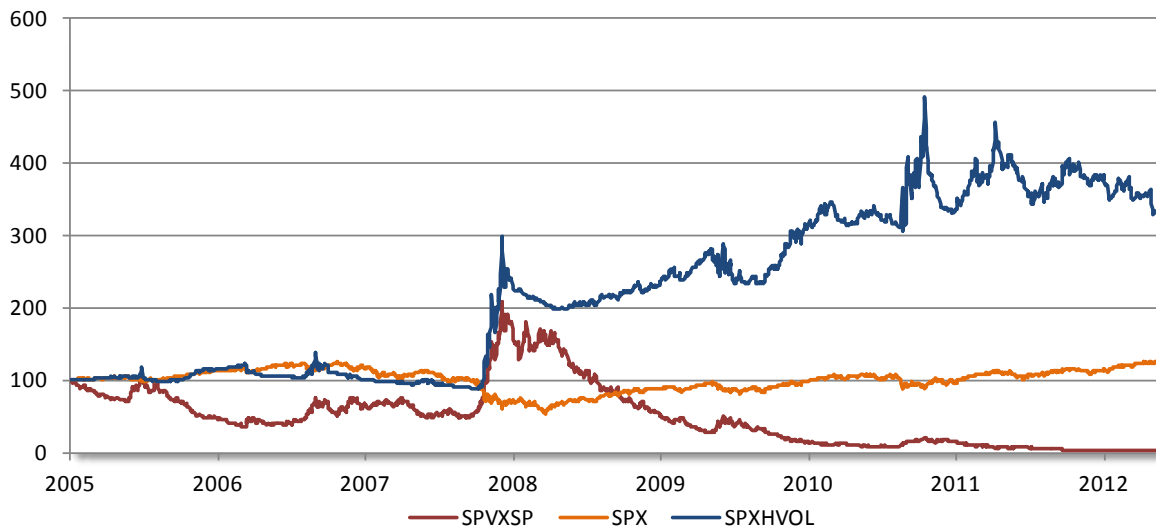
Sources: VelocityShares, Bloomberg; December 2005-April 2013

\*Data as of April 30th 2013. Charts and graphs are provided for illustrative purposes only. It is not possible to invest directly in an index. Past performance is not an indication of future results. The Indices were launched on April 30th, 2012, all data presented prior to the inception date is back tested. Please see the performance disclosure for more information on the Index and the inherent limitations associated with back-tested index performance.

## VOLATILITY HEDGED INDEX (SPXHVOL)

Figure 14 presents the performance of the VelocityShares Volatility Hedged Vol Component Index (Long/Short Volatility Index). The Long/Short Vol Index does not rally as much as the Tail Risk Index, but it does produce more stable returns during periods of lower volatility. The allocation in this index is 1/3<sup>rd</sup> leveraged long exposure and a 2/3<sup>rd</sup> short exposure to the VIX Short-Term Futures Index.

FIGURE 14: LONG/SHORT VOLATILITY INDEX\*



Source: VelocityShares, Bloomberg, December 2005-April 2013

\*Data as of April 30th 2013. Charts and graphs are provided for illustrative purposes only. It is not possible to invest directly in an index. Past performance is not an indication of future results. The Indices were launched on April 30th, 2012, all data presented prior to the inception date is back tested. Please see the performance disclosure for more information on the Index and the inherent limitations associated with back-tested index performance.

While only two strategies were discussed, there are clearly a large number of combinations that could be employed in the development of different strategies. As shown in Figure 15, each strategy has different performance profiles, and it is up to the manager to determine which approach represents the best fit for the portfolio and market view.

**FIGURE 15: SIMULATED MONTHLY RETURNS OF VELOCITYSHARES VOLATILITY INDICES**

TRSKVOL - VelocityShares Tail Risk Hedged Large Cap Vol Component													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Year
2006	-2.75%	-1.03%	-0.77%	-0.91%	9.68%	-8.43%	-1.55%	-1.75%	-0.76%	3.07%	-0.06%	-0.67%	-6.6%
2007	-2.19%	-4.04%	-0.98%	-5.15%	-1.02%	3.06%	15.57%	12.39%	-11.51%	-2.99%	1.90%	-4.84%	-2.8%
2008	0.99%	0.06%	-2.13%	-5.11%	-1.43%	-2.43%	-3.82%	-3.35%	11.95%	162.30%	20.14%	-8.70%	170.2%
2009	-2.84%	-0.99%	-2.33%	-7.04%	-1.72%	-1.51%	-1.21%	-0.62%	-1.40%	-1.29%	-2.33%	-0.05%	-21.1%
2010	0.27%	-3.82%	1.75%	-0.82%	7.14%	1.76%	-14.52%	-2.08%	1.52%	4.67%	1.22%	1.43%	-3.1%
2011	0.57%	-2.07%	-4.62%	-1.16%	-0.67%	-5.46%	-0.12%	34.51%	42.50%	-29.20%	-5.36%	-2.46%	9.1%
2012	4.21%	-2.25%	2.71%	-5.98%	-1.37%	-15.16%	-3.22%	1.29%	-0.70%	-1.79%	-5.95%	-6.49%	-30.8%
2013	-3.21%	-4.44%	-3.16%	-7.72%									-17.3%

SPXHVOL - VelocityShares Volatility Hedged Large Cap Vol Component Index													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Year
2006	1.16%	1.60%	1.21%	0.37%	0.47%	-5.38%	-2.00%	3.09%	1.85%	10.52%	1.64%	0.46%	15.3%
2007	2.50%	-6.07%	-3.28%	-1.51%	-0.22%	-1.57%	6.66%	5.84%	-6.22%	-2.34%	-5.30%	-2.35%	-13.9%
2008	-1.45%	-1.09%	-2.31%	2.08%	2.90%	-6.27%	-2.75%	-0.90%	0.12%	116.87%	17.65%	-2.27%	125.6%
2009	-4.89%	-2.68%	-3.84%	-0.76%	4.22%	1.74%	1.54%	0.68%	3.69%	-0.61%	2.84%	5.09%	6.6%
2010	1.52%	2.10%	7.70%	-1.32%	-4.24%	-0.84%	-4.79%	-1.08%	7.67%	11.94%	1.84%	9.10%	31.9%
2011	4.53%	-0.44%	-3.87%	6.11%	1.72%	-4.75%	-3.74%	12.86%	30.77%	-21.96%	-6.85%	2.32%	8.7%
2012	11.64%	-0.17%	12.46%	-5.19%	-8.28%	-5.81%	-0.47%	5.61%	5.61%	-2.83%	0.62%	-8.54%	1.9%
2013	4.55%	-4.27%	1.74%	-5.92%									-4.2%

Source: VelocityShares, Bloomberg

The returns in the tables above are two of the VelocityShares Indices, each of which has a unique allocation to 2x leveraged long and -1x exposure to VIX futures indices.

## CONCLUSION

Developing cost-effective strategies to hedge sell-offs in the equity markets is challenging. The negative correlation of the VIX to the S&P 500, the performance characteristics of the VIX Futures Indices, and the convexity of daily resetting leveraged long and inverse exposures enable sophisticated managers to design strategies to hedge significant equity market sell-offs and more efficiently execute their views on volatility.



## DISCLOSURES

*It is not possible to invest directly in an index. Exposure to an asset class is available through investable instruments based on an index. There is no assurance that investment products based on the index will accurately track index performance or provide positive investment returns.*

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## PERFORMANCE DISCLOSURE REGARDING THE VELOCITYSHARES INDICES

*The inception date for these VelocityShares Indices is April 30th, 2012, and all data prior to this date is back tested. The back-test calculations are based on the same methodology that was in effect when the index was officially launched. Prior to October 4, 2011, the volatility ETFs used in the Index did not exist. Index calculations for these components are computed based off a similar exposure directly to VIX futures, and therefore do not reflect the management fees of the ETFs among other differences for the period prior to October 4, 2011. Had the volatility ETFs been available prior to October 4, 2011, the back tested index returns would likely have been lower. Prospective application of the methodology used to construct each of the indices may not result in performance commensurate with the back-test returns shown. Please refer to the methodology paper for these indices, available at [www.velocityindices.com](http://www.velocityindices.com) for more details about the indices, including the manner in which it is rebalanced, and the timing of such rebalancing, criteria for additions and deletions and index calculation. The indices are rules based, although the Index Committee reserves the right to exercise discretion, when necessary. The index performance has inherent limitations. The index returns shown do not represent the results of actual trading of investor assets. VelocityShares maintains the indices and calculates the index levels and performance shown or discussed, but does not manage actual assets. Index returns do not reflect payment of any sales charges or fees an investor would pay to purchase the securities they represent. The imposition of these fees and charges would cause actual and back-tested performance to be lower than the performance shown.*

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