



VelocityShares
Volatility Hedged
Equity
Indices
Methodology

September 4, 2012

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Introduction

The VelocityShares Volatility Hedged Equity Indices are designed to replicate a portfolio consisting of a large cap equity exposure and an allocation to a volatility strategy. There are two indices in the family: the VelocityShares Tail Risk Hedged Large Cap Index reflects the performance of a portfolio consisting of an exposure to (1) a large cap equity portfolio and (2) an exposure to a volatility strategy to hedge tail risk events, and the VelocityShares Volatility Hedged Large Cap Index reflects the performance of a portfolio consisting of an exposure to (1) a large cap equity portfolio and (2) an exposure to a volatility strategy designed to hedge moderate volatility while balancing the risk/return profile of the volatility strategy.

The indices are designed to be investible – 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 reference securities are US listed exchange traded products (ETPs). The reference securities underlying the volatility strategy are daily-resetting leveraged long and inverse ETPs, and the reference securities underlying the equity component of the indices represent the large capitalization equity market.

Index Construction

The VelocityShares Volatility Hedged Equity Indices family includes:

- VelocityShares Tail Risk Hedged Large Cap Index
- VelocityShares Volatility Hedged Large Cap Index

Each is composed of an 85% allocation to US large cap equities (through reference to S&P 500-linked ETPs) and a 15% allocation to a volatility-based hedging strategy (through reference to VIX futures-linked ETPs).

The volatility-based hedging strategy in the Tail Risk Hedged Large Cap Index seeks to generate straddle-like exposure to short-dated VIX futures, with a target long exposure of 35%.

The volatility-based hedging strategy in the Volatility Hedged Large Cap Index seeks to generate straddle-like exposure to short-dated VIX futures, with a target neutral exposure.

The volatility-based hedging strategies are based on the principles originally published by VelocityShares in the white paper [“Portfolio Applications for VIX Based Instruments.”](#)¹

The reference securities are all US listed ETPs.

Constituent Prices

The closing price for each reference security on an index business day is the price of the security, expressed in US dollars, at the regular close of the principal trading session on the primary exchange on which the security is listed as published by that exchange for that index business day.

Index Calculations

Step 1: Initial Allocation

Let

$$H_0 = 100$$

denote the beginning value of the Hedged Index on December 20th, 2005. The Volatility Hedged Equity Indices will seek to hold a target weight of 85% in ETPs that represent the large cap equity market, and a target weight of 15% for

¹ “Portfolio Applications for VIX Based Instruments” Journal of Indexes, Nov/Dec 2011

the volatility strategy referencing volatility-related ETPs (please see Appendix I for specifics about the reference ETPs).

The volatility strategy allocation will be divided into 13 sub-portfolios, each reflecting a position in an ETP with a two-times (2X) leveraged exposure to a short-term VIX futures index and an ETP with an inverse (-1X) exposure to the same short-term VIX futures index. The initial allocation between the leveraged and inverse exposures for the volatility strategy for each index is presented in the following table:

Volatility Strategy Initial/Target Allocations

| Index | Initial Allocation |
|--|---------------------|
| VelocityShares Tail Risk Hedged Large Cap Index | 45% (2X), 55% (-1X) |
| VelocityShares Volatility Hedged Large Cap Index | 1/3 (2X), 2/3 (-1X) |

The total number of positions in the reference portfolio is 29, each subscripted by i :

- Three large cap equity market ETP positions ($i = 1$ to 3)
- 13 Leveraged (2X) VIX futures ETP Positions ($i = 4$ to 16)
- 13 Inverse (-X) VIX futures ETP Positions ($i = 17$ to 29)

The value

$$V_i(t)$$

represents the value of the position at the end of day t prior to any rebalancing.

All of the reference securities are US listed ETPs.

Step 2: Define Returns

The return to each of the large cap equity market ETPs represents a dividend-reinvested return on the market as represented by the associated exchange traded product. Thus the return for positions $i = 1$ to 3 is:

$$r_{i,t} = \frac{P_{i,t} + D_{i,t}}{P_{i,t-1}} - 1$$

where D represents dividends or other distributions.²

The return for reference securities $i = 4$ to 16 is

² Please see Appendix II regarding periods where data is unavailable.

$$r_{i,t} = \frac{P_{Lev,t} + D_{Lev,t}}{P_{Lev,t-1}} - 1$$

where

$$P_{Lev,t}$$

is the time t price of an exchange traded product that seeks to return two-times (2X) leveraged exposure to VIX Futures and D represents dividends or other distributions.³

The return for positions $i = 17$ to 29 is

$$r_{i,t} = \frac{P_{Inv,t} + D_{Inv,t}}{P_{Inv,t-1}} - 1$$

where

$$P_{Inv,t}$$

is the time t price of an exchange traded product that seeks to return inverse exposure (-1X) to a VIX futures index and D represents dividends or other distributions for that reference security.⁴

Step 3: Weekly Rebalancing

If t is a Business Day that falls on a Wednesday or if t is a Business Day that falls on a Thursday immediately following a Wednesday that was *not* a Business Day, the portfolio will perform a Weekly Rebalance, and t is considered a Weekly Rebalance Day (WRD). On each WRD we denominate a sub-portfolio, j, to rebalance; we set the first sub-portfolio on December 21st, 2005 to one, and we increment each subsequent sub-portfolio to rebalance by one, unless $j > 13$, in which case it resets to one. In this fashion one sub-portfolio is rebalanced weekly and every sub-portfolio is rebalanced once a quarter.

On a WRD sub-portfolio j is rebalanced as follows:

³ Please see Appendix II regarding periods where data is unavailable.

⁴ Please see Appendix II regarding periods where data is unavailable.

$$\begin{aligned}\widehat{V}_{3+j}(t) &= w_{Lev}^* \times [V_{3+j}(t) + V_{16+j}(t)] \\ \widehat{V}_{16+j}(t) &= w_{Inv}^* \times [V_{3+j}(t) + V_{16+j}(t)]\end{aligned}$$

where

$$w_{Lev}^*$$

represents the target weight for the leveraged exposure to the VIX futures index, and

$$w_{Inv}^*$$

represents the target weight for the inverse exposure to the VIX futures index. The two weights sum to one.

For the remaining sub-portfolios:

$$\begin{aligned}\widehat{V}_{3+k}(t) &= V_{3+k}(t) \\ \widehat{V}_{16+k}(t) &= V_{16+k}(t) \\ k &= 1 \text{ to } 13 \\ k &\neq j\end{aligned}$$

For completion's sake,

$$\begin{aligned}\widehat{V}_i(t) &= V_i(t) \\ i &= 1 \text{ to } 3\end{aligned}$$

If t is not a WRD, for all i

$$\widehat{V}_i(t) = V_i(t)$$

Step 4: Monthly Rebalancing

On the last Business Day of each month, the portfolio is rebalanced such that the large cap equity market positions account for 85% of the portfolio value and VIX futures index positions account for 15% of the portfolio value.

The total portfolio value at time t,

$$V^*(t)$$

If t is a monthly rebalance date then

$$\begin{aligned} \tilde{V}_i(t) &= \frac{0.85}{3} V^*(t) \\ i &= 1 \text{ to } 3 \end{aligned}$$

and

$$\begin{aligned} \tilde{V}_i(t) &= 0.15 \times \left(\sum_{i=4}^{29} V_i(t) \right)^{-1} \times V^*(t) \times \hat{V}_i(t) \\ i &> 3 \end{aligned}$$

If t is not a monthly rebalance date, then for all i :

$$\tilde{V}_i(t) = \hat{V}_i(t)$$

Step 5: Quarterly Rebalancing

If t is the last Business Day of the quarter, t is considered a quarterly rebalance day. The positions are rebalanced as follows:

$$\beta_i = \frac{1}{13} \frac{\tilde{V}_i(t) + \tilde{V}_{i+13}(t)}{\sum_{i=4}^{29} \tilde{V}_i(t)}$$

$$\begin{aligned} \bar{V}_i(t) &= \beta_i \tilde{V}_i(t) \\ \bar{V}_{i+13}(t) &= \beta_i \tilde{V}_{i+13}(t) \\ i &= 4 \text{ to } 16 \end{aligned}$$

$$\begin{aligned} \bar{V}_i(t) &= \tilde{V}_i(t) \\ i &= 1 \text{ to } 3 \end{aligned}$$

If t is not quarterly rebalance day then for all i

$$\bar{V}_i(t) = \tilde{V}_i(t)$$

Step6: Calculating Hedged Index

$$H_t = H_{t-1} (1 + R_t)$$

where

$$R_t = \left(\sum_{i=1}^{29} \bar{V}_i(t) \right) / \left(\sum_{i=1}^{29} \bar{V}_i(t-1) \right) - 1$$

Intra-day Index Calculation

The value of the index will be calculated intra-day (R_D) by applying the then current adjusted market prices of the reference securities as if they were the end of day prices and following the end-of-day calculations described above.

Index Maintenance

Base Date

Each index has a level of 100 on the inception date, and on each index business day thereafter the index level is equal to the index level at the beginning of the period times the sum of one plus the index return (R) for the period. (Please see Appendix II)

Rebalancing

Each index will be rebalanced to its target ratio between the large cap exposure and the volatility strategy on a monthly basis in accordance with the aforementioned methodology. One sub-portfolio of the volatility strategy is rebalanced on a weekly basis, such that each of the 13 sub-portfolios will be rebalanced quarterly in accordance with the aforementioned methodology.

Corporate Actions

Corporate events, such as dividends, stock splits, spin-offs, mergers, rights offerings, etc. will result in either (i) an adjustment to the price of the instrument underlying the index or (ii) termination of the index, each as described below.

- **Stock splits and reverse stock split**

The number of shares of an entity is adjusted (number of shares multiplied by the split ratio) based on the stock split factor and the price is adjusted (price multiplied by the reciprocal of the stock split ratio) based on the stock split factor. In a 2-for-1 stock split the adjustment factor is 2, so the number of shares is multiplied by 2 and the price is multiplied by $\frac{1}{2}$.

- **Cash dividend**

Cash dividends paid by reference securities are reinvested into that reference security. This would have the effect of increasing the total return of the index.

Corporate actions are applied after the close of trading on the day prior to the ex-date.

The index committee will be solely responsible for the determination and calculation of any adjustments to the price of any instrument underlying an index and of any related determinations and calculations with respect to any corporate action and its determinations and calculations will be conclusive absent manifest error.

Complex corporate actions: should any corporate action exist which the index committee deems requires a price adjustment, it will be solely responsible for determining the method and timing for any necessary price adjustments. In the case of simultaneous corporate actions, the index committee will determine the

application of the above price adjustments which is the most accurate reflection of the impact of the corporate actions.

Index Policy

Announcements

Announcements regarding changes to any of the VelocityShares indices will be made publicly available prior to the effective date of the change. All announcements will be published on the index website: www.velocitysharesindices.com

Holiday Schedule

Each VelocityShares index will be calculated on days when (a) the New York Stock Exchange is open for trading and (b) the primary exchange for the reference securities is open for trading. (Please see Appendix II)

Force Majeure or Market Disruption

Calculation of the index may not be possible or feasible under certain events or circumstances, including, without limitation, market disruptions, a systems failure, natural or man-made disaster, act of God, armed conflict, act of terrorism, riot or labor disruption or any similar intervening circumstance, that is beyond the reasonable control of the index provider and that the index provider determines affects the Index or underlying markets. Upon the occurrence of any such force majeure event, the index provider may, in its discretion, elect one (or more) of the following options:

- Make such determinations and/or adjustments to the terms of the Index as it considers appropriate to determine any closing level on any such appropriate index business day; and/or
- Defer publication of the information relating to the index until the next index business day on which it determines that no force majeure event exists; and/or
- Permanently cancel the publication of the information relating to the index. The index provider employs the methodology described above and its application of the methodology shall be conclusive and binding.

Index Committee

The index committee is responsible for reviewing the design, composition, and calculation of the VelocityShares Indices, the development of new indices, and to determine changes, if any, to the index methodology, and the treatment of corporate actions.

Decisions made by the index committee include all matters relating to index policy and maintenance. The index committee meets periodically to review market conditions and index performance. The committee meets on as-needed basis to address major market developments.

The index committee reserves the right to exercise its discretion in making decisions with respect to any index policy or action. Index committee internal procedures and discussions are considered to be potentially market moving and are therefore kept confidential.

Index Dissemination

Index Tickers

The indices are calculated in real-time and disseminated over the Consolidated Tape Association every 15 seconds during the US trading Day. Official closing index levels are published each index business day at approximately 6PM Eastern Time and are published to www.velocitysharesindices.com.

FTP

Daily index level information is available via FTP. Please contact index@velocityshares.com for subscription information.

Contact Information

index@velocityshares.com

www.velocitysharesindices.com

19 Old Kings Highway South
Suite 120
Darien, CT 06820

+1 203 992 4301

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Appendix I: Reference ETPs

| Reference ETP | Ticker | Primary Exchange |
|---|---------------|-------------------------|
| S&P 500 ETF Trust (SPDR) | SPY | NYSE |
| S&P 500 ETF (Vanguard) | VOO | NYSE |
| S&P 500 Index Fund/US (iShares) | IVV | NYSE |
| Ultra VIX Short-Term Futures ETF (ProShares) | UVXY | NYSE |
| Short VIX Short-Term Futures ETF (ProShares) | SVXY | NYSE |

Appendix II: Holiday Schedule

NYSE Holiday Schedule

| 2012 | 2013 | 2014 |
|------------------|-------------|-------------|
| January 1 | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Appendix III

Historical Data

Where return data is unavailable for the large cap equity market exchange traded product historically, the return of the SPTR Index (S&P 500 Total Return Index) is used as a substitute solely for historical backfilling purposes.

Where return data is unavailable for the 2X leveraged exposure, we use twice the return of the S&P 500 VIX Short-Term Futures Index solely for historical backfilling purposes:

$$r_{i,t} = 2 \times \left(\frac{SPVXSP_t}{SPVXSP_{t-1}} - 1 \right)$$

Where return data is unavailable for the inverse exposure, we use the negative of the return of the S&P 500 VIX Short-Term Futures Index solely for backfilling purposes:

$$r_{i,t} = -1 \times \left(\frac{SPVXSP_t}{SPVXSP_{t-1}} - 1 \right)$$