



In Free Fall and Yet Attractive? Short Volatility ETFs

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In the twelve days between January 26th and February 6th in 2018, the S&P500 temporarily lost almost -10%. In the same period, a type of Exchange Traded Fund (ETF), so-called "Short Volatility ETFs" or "Inverse Volatility ETFs" lost more than -80% of their value. The main focus was on the two products "ProShares Short VIX Short-Term Futures (SVXY)" and "VelocityShares Daily Inverse VIX Short-Term ETN (XIV)". On the two business days from February 2nd to February 6th, SVXY corrected by -88% (see Exhibit 1). How can an ETF, which is also accessible to retail investors, suffer almost total loss in such a short time?

Short volatility products rely on the underlying volatility measure, such as VIX, to decrease or remain constant. The VIX is an index calculated from options on the S&P500 index with a maturity of 30 days. It is not directly tradable, but there are futures contracts with the underlying VIX. These futures contracts are offered with maturities

of up to nine months in the future. It is very important that SVXY and XIV are based on DAILY percentage changes in the VIX futures: The maximum gain of SVXY through a daily price movement occurs when the VIX drops by -100%, i.e., the unrealistic case it falls to a value of 0. Then the value of the ETF would double within one day. A "killer", on the other hand, is a fast, violent upward rash. If, for example, the VIX futures explode from 10 to 20 in just one day, a price change of +100%, this means a loss of -100% of the inverse ETFs. On the other hand, if the VIX futures increases by 1 to 20 on 10 consecutive days, there is a loss of "only" -52.6%, see Exhibit 2. In Exhibit 2, on the next page, an investment of USD 100 is assumed whose value (NAV) is only USD 47.4 ten days later after a gradual increase in the VIX from 10 to 20.

The maximum loss of short volatility ETFs is theoretically infinite. With the VIX's low price levels of 10, the probability of a movement



Exhibit 1: Price history of VIX and SVXY

Source: Yahoo Finance

Day	VIX-Fut.	Absolute change VIX-fut.	Percentage change VIX-fut.	NAV
0	10	n/a	n/a	100.0
1	11	1	10%	90.0
2	12	1	9%	81.8
3	13	1	8%	75.0
4	14	1	8%	69.2
5	15	1	7%	64.3
6	16	1	7%	60.0
7	17	1	6%	56.3
8	18	1	6%	52.9
9	19	1	6%	50.0
10	20	1	5%	47.4

Exhibit 2: Increase in VIX over ten days from 10 to 20

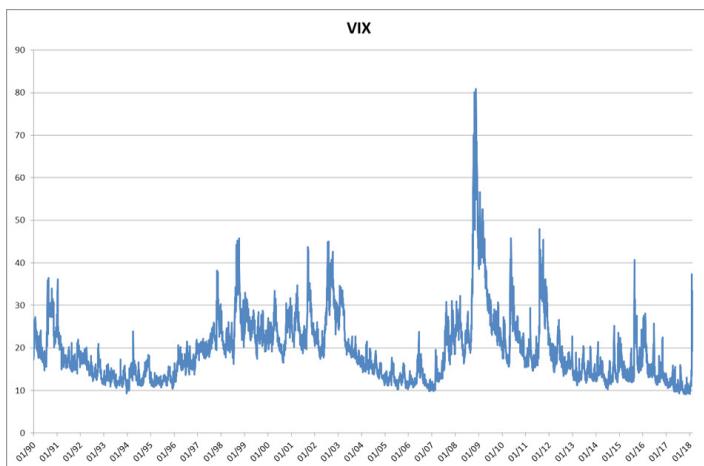


Exhibit 3: History of VIX from January 1990 to February 2018

Source: Yahoo Finance

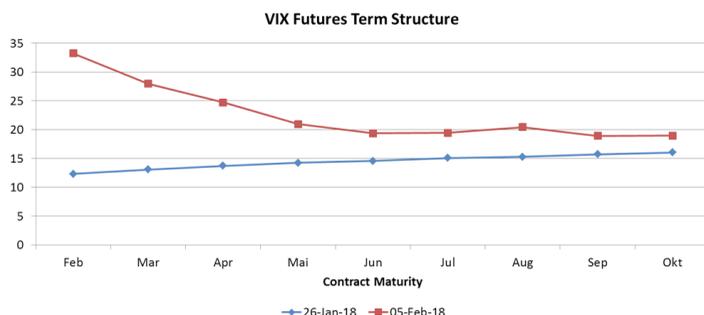


Exhibit 4: Term structure of the VIX futures

Source: CBOE website

from +100% to 20 or even +200% to 30 is significantly higher than in the upper regions above 25, such as from 30 to 60. In January 2018, the VIX was between 9.2 and 14.8. In a similar range, the VIX stayed for the entire year 2017, see Exhibit 3.

At VIX around 10 short volatility ETFs can therefore be said to have an unfavourable asymmetric risk profile, while a favourable asymmetric risk profile can be seen for VIX above 35. However, the latter does not mean that losses can be excluded if you buy inverse volatility products from a VIX over 35. There were times in the past when the VIX was already higher than 50 and still increased by 20% and more (e.g., October 2008).

How do Short Volatility products make money in times of low volatility?

Exhibit 4 shows the term structures of the nine VIX futures with maturities from February to October on two days: January 26, 2018 (blue) and February 5, 2018 (red). The blue curve follows a normal course: the short end, i.e., the maturities February and March, are recorded under the longer maturities such as August and September. If the VIX would remain constant, you can earn money by rolling down the futures. The difference between the March contract (13.075) and the February contract (12.325) on January 26th was $12.325 - 13.075 = -0.75$. Assuming that an inverse volatility ETF enters a short position in the March contract at 13.075 and holds it for one month, the position rolls to a value of 12.325, which corresponds to a gain of $+0.75$ or $0.75 / 13.075 = +5.7\%$. In reality, financing and management costs have to be deducted from this, but there is still a considerable return on investment for a holding period of one month. If the VIX falls, the corresponding price movement of the VIX futures contract is added.

From 2012 to 2017, SVXY has achieved returns of 156%, 104%, -9%, -17%, 80% and 179%. The results of XIV were at a similar level. Those who invested at the end of 2011 could look forward to a return of 1870% until the end of 2017, which is a nineteen-fold increase in invested capital! However, the volatility was 66%. That is still some distance away from Bitcoin spheres - where volatility was 170% in the same period of time - but still with gusto. By way of comparison: The volatility of the S&P500 was 12%.

The goal of SVXY is to reflect the inverse change in the short-term volatility measure VIX. "Short-term" means that the ETF enters short positions in the two futures contracts with the next two maturities. On 5 February, the VIX jumped 116%, the futures contracts for February by 113% and for March by 87%. On this day, SVXY lost nearly -100% of its value (source: ProShares website). If the leap in the VIX or futures contracts had been even higher, the investor's entire invested capital would have been lost and the issuer of the ETF would have had to bear any additional losses. Credit Suisse, the issuer of XIV, has terminated its ETF and will repay the remaining capital to investors. According to media reports, it has not suffered any losses from the price activity of the XIV (Kilburn (2018)). It is not known how the issuer of the SVXY, ProShares, fared.

The market power of the short volatility products manifests itself in the open interest, i.e., the number of outstanding contracts, of

SVXY: AuM and Shares Outstanding

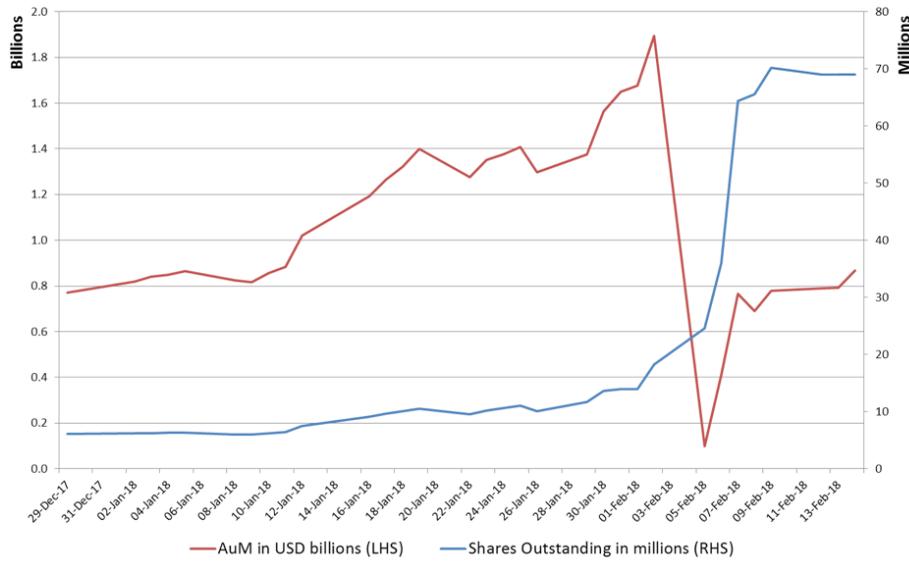


Exhibit 5: Assets under Management of SVXY and shares outstanding

Source: ProShares website

VIX threshold	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85
#days > threshold	7019	4653	2653	1241	582	293	168	89	56	41	27	18	6	3	2	0
%days > threshold	99.0%	65.7%	37.4%	17.5%	8.2%	4.1%	2.4%	1.3%	0.8%	0.6%	0.4%	0.3%	0.1%	0.0%	0.0%	0.0%

Exhibit 6: Proportion of days on which the VIX was above different thresholds (January 1990 to January 2018; a total of 7087 days)

the VIX futures. On January 26th, just under 630,000 VIX futures contracts were outstanding for all maturities (data source: CBOE website). Of these, SVXY alone held short positions in about 103,000 contracts, or 16.4% of all outstanding contracts! On February 5th, i.e., after the fall in the ETF's price, SVXY held only about 3,400 contracts or 0.5% of the outstanding contracts.

Why Do Investors Buy a Product That Has Suffered Such Ruinous Price Losses?

SVXY was launched at the end of 2011 and reached the peak of its managed capital shortly before its collapse: on February 2, 2018, it had almost USD 1.9 billion, which had shrunk to just under USD 0.1 billion by the end of February 5, 2018, see Exhibit 5.

Interestingly, the outstanding shares rose sharply shortly after the sharp price losses. Obviously, some investors have taken massive action. The outstanding shares peaked on February 9, 2018. Since then, their number has stabilised at just under 70 million. Why did investors enter this market? The answer lies in the VIX's ability to keep returning from levels above 20 to values below 20 ("mean reversion"), see Exhibit 3. The long-term average from early 1990 to February 2018 is 19.4; the average in the last

few years since 2013 is significantly lower at 14.4. Fears flaring up every now and then are expressed in a rising VIX. When the situation calms down, life returns to normality and the VIX sinks again.

After the sharp rise of the VIX to a value of 37 at the beginning of February, the probability that the VIX will register another strong increase (e.g., by a further +50% to 55.5) is lower than a significant decrease (e.g., by -50% to 18.5). Exhibit 6 shows, for example, that the VIX traded above 35 on 293 days in the period from January 1990 to January 2018, or in 4.1% of all cases above 35, or in approximately 96% of all cases below. It is therefore likely that it will fall back below 35.

Exhibit 7 shows the number of days since 1990 on which VIX has increased by various percentage amounts. For example, it climbed by 20% or more on 79 days. This corresponds to 1.1% of all daily movements. It increased by 70% or more on only one day, on February 5, 2018 by 116%.

This brings us closer to the reason why investors are once again accessing the market immediately after the devastating price losses of short volatility products: the combination of a bet on falling volatility, the VIX close to the summit and the "Mean Reversion" property of the VIX transforms the unfavourable asymmetric risk

Change VIX% > X%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	110%	120%
# days > X%	420	79	31	13	5	2	1	1	1	1	1	0
%days > X%	5.9%	1.1%	0.4%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Exhibit 7: Number of days with increase in VIX by various thresholds from January 1990 to January 2018

profile of the SVXY with a VIX close to its historical lows into a favourable asymmetric risk profile. However, the window of opportunity for the favourable risk profile is extremely short (at best a few days) and only very risk-tolerant experts will be able to react so quickly.

Are Short Volatility Products Suitable Investment Modules for Me?

Short volatility ETFs securitise an investment strategy that delivers a fairly high return in a quiet market environment. However, there are always market phases in which they realise catastrophic losses that can reach as far as total loss - as we have seen. As a rule, these phases of loss occur when the stock markets incur heavy losses and thus at a point in time that cannot be more unfavourable. They are therefore completely unsuitable as building blocks in a long-term oriented portfolio. However, for investors who are willing to take risks and focus on short-term trading, a temporary position can make sense if the VIX reaches higher levels of 35 or more. Then the asymmetric risk profile turns from unfavourable to favourable. In the worst case scenario, assuming a total loss of the Short Volatility ETF, an investment of 1% of the portfolio in this ETF results in a return of -1% at portfolio level. A short-term oriented and risk-tolerant investor could opportunistically invest in such a short volatility ETF on a VIX over 35. However, the investment decision must be made in a very short time frame of at best a few days, in which many other parts of his portfolio will also suffer from high price losses. Once the VIX falls well below the 35 mark, e.g., close to 15, the Short Volatility ETF should be sold again.

Reference

Kilburn, Faye: "XIV hedging rule helped protect Credit Suisse," *Risk Magazine*, 6 February 2018.

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Since June 2010 Dr. Claus Huber, CEFA, CFA, FRM, has been running Rodex Risk Advisers, a risk management consultancy based in Switzerland. A few of the topics covered by Rodex are Alternative Investments, portfolio construction, tail risk insurance, inflation and deflation protection, and market and operational risk. Claus is also co-founder of DeinAnlageberater.ch, a Swiss-based robo-advisor, as well as of DeinAnlageberater.de, a German-based robo-advisor. He is the Head of Risk Management of TradeCap AG, a Swiss fund of Liquid Alternatives. Claus's previous roles include Head of Alternative Investment Risk Management at Swiss Re Zurich, Chief Risk Officer at Credaris Portfolio Management, London, Credit Strategist and Hedge Fund Analyst at Deutsche Bank in Frankfurt/Main, research associate at the University of Bremen and bond trader at Bankgesellschaft Berlin. Claus has published numerous papers on various topics in Finance.