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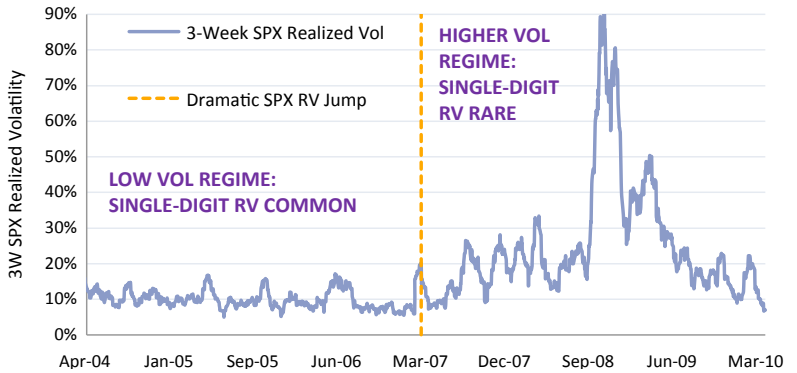
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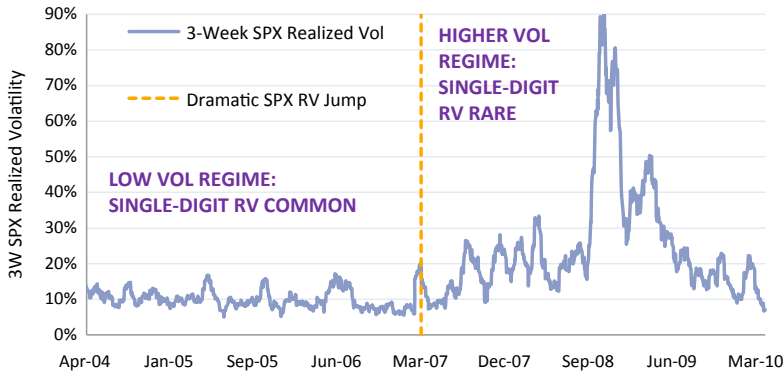
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# VIX & Tails: Hedging With Volatility

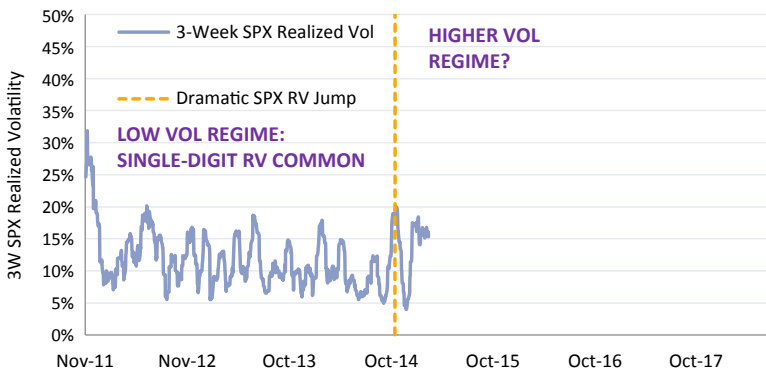
By Rocky Fishman



Source: Deutsche Bank



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**EQUITY VOLATILITY—IN PARTICULAR THE VIX—HAS BEEN GAINING ATTENTION LATELY,** less for its overall level (general volatility levels have been below average the last couple of years) than for the quick changes we’ve seen in market behavior, and the impact of those changes on investors’ portfolios.

## A RARE AND OMINOUS PATTERN

The rapid changes in SPX realized volatility seen in September/October, and then again in December/January, are almost unprecedented. In the past 40 years, the only two times when the SPX transitioned from sub-7 percent three-week realized volatility to >18 percent realized vol in the three weeks immediately thereafter happened in the vicinity of major vol regime shifts—occurring just months before an extended low vol regime ended (though each included a brief return to low volatility).

What was interesting about the past few months is that this rare pattern was essentially repeated twice—accentuating the recent surge in vol-of-vol.

## A LONG-TERM TREND TOWARD HIGHER VOL SPIKES

By nature, multiple-standard deviation events do not happen very often. As “tailologists,” we have no choice but to work with limited sample sizes. To get a feel for the behavior of volatility in tail events, we have taken a look at SPX returns of the past 35 years and examined all “two-sigma in less than three months” pullbacks. We have found that the explosion of volatility—both implied and realized—accompanying such events seems to be on the rise. The image below shows changes in volatility around two-sigma SPX selloffs since 1980:

We observe:

- With the notable exception of 1987, realized volatility has been more explosive in recent tail events than in prior ones. Each of the periods around a tail event from 1998 has come with a 3-week period of 45 percent realized vol, except for 2010. The October 1987 crash was the only three-week period when the SPX saw 40 percent+ realized vol over a 35-year period ending in November 1997.

- At times prior to the late 1990's, the SPX could suffer a multi-sigma selloff with low volatility (realized vol not jumping much at all—even for a short period). Now, explosive reactions of realized volatility are common.

### VIX PRODUCTS KEY TO VOLATILITY MARKETS

The past few years have seen rapid growth in VIX derivatives, making its futures, options, and futures-linked ETNs/ETFs the largest marketplaces for short-dated implied volatility risk. The trend toward active volatility trading, and structural characteristics of the ETN/ETF products, have helped volatility itself begin to move faster in recent years. VIX markets are also a great source of information about expected volatility, and also expected volatility-of-volatility. While VIX markets dominate short-dated (<three-month) volatility trading, the active and liquid market for variance swaps is available for longer-dated trading.

### VOL-OF-VOL ON THE RISE

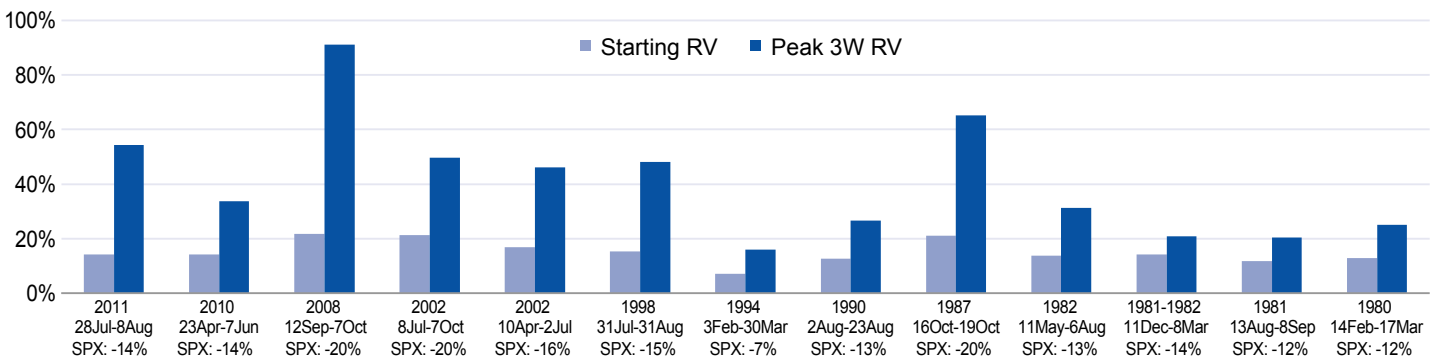
Volatility of volatility has been rising over the past few months in the U.S. equity market—resulting in a wider range of implied (expected) and realized (actual historical) volatility. Vol-of-vol can be a source of confusion because there are actually three forms of it. Each of these three forms of vol-of-vol has been on the rise:

- **Changes in SPX realized vol: 5 percent pullback, lowest vol in decades, 5 percent pullback.** Volatility of SPX realized vol was clear in Q4: November was the lowest realized vol month since 1966—yet October and December each featured >5 percent pullbacks and more than triple November's realized vol.
- **Changes in the VIX, VIX futures, and other implied volatility metrics: VIX multi-year high and low in 3M.** Implied volatility moves were highlighted by the VIX hitting multi-year lows (10.3 on 3-Jul) and highs (31 intraday on 15-Oct) in just over three months.
- **Implied volatility of VIX options: highest VVIX in years.** Implied volatility of implied volatility. The VVIX measure of expected vol-of-vol (as implied by VIX option prices) has trended higher over the past two years, hitting very high peak levels in October and December.



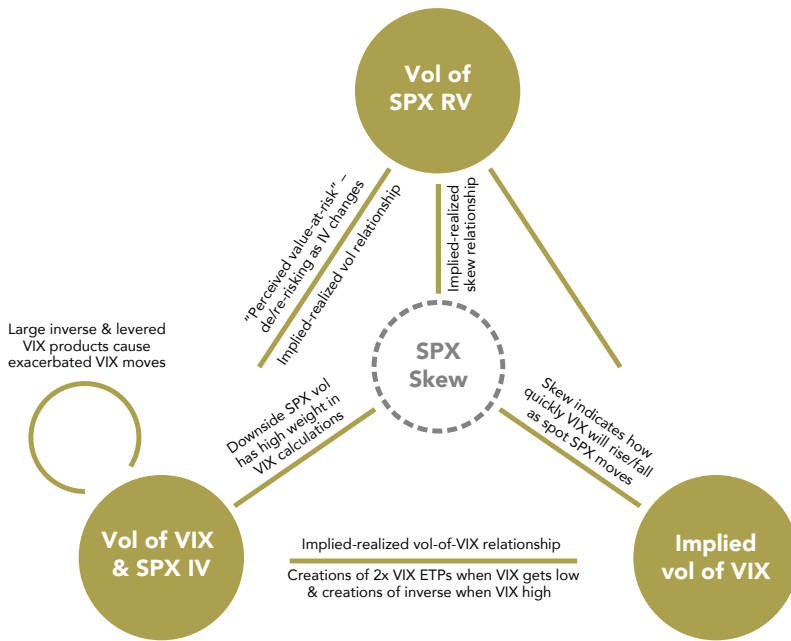
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PRIOR TO 1998, THE OCT 1987 CRASH WAS THE ONLY 3-WEEK, 40% RV PERIOD FOR SEVERAL DECADES

Source: Deutsche Bank



Source: Deutsche Bank

### THE VOL-OF-VOL TRIANGLE

The three types of vol-of-vol highlighted above are strongly interconnected—by fundamental factors (implied vs realized vol, skew connections), and by technical factors. These factors drive vol-of-vol in both directions: pushing both implied and realized volatility to higher highs and lower lows:

While some of these connections are self-explanatory, others require some explanation:

- **Skew as a connector.** Implied volatility skew, or the difference between implied volatility of put and call prices, is a key driver of the relationship between spot index and implied volatility movements—as well as a driver of the price of VIX options. As a result, it sits in the middle of the vol-of-vol triangle, facilitating connections between these three.
- **Perceived risk.** High implied volatility in the market increases investors’ perception of risk in

their portfolios. To maintain a constant “perceived value-at-risk,” many investors will tend to de-risk as implied volatility rises, leading to higher SPX realized vol in selloffs. This is particularly relevant currently, with many hedge funds challenged after underperforming the broad equity market’s last few years’ rally.

- **VIX ETP flows.** Flows in VIX futures generated by VIX exchange-traded products (ETPs) can be a very important source of supply/demand in the volatility market. Flows from these products can result from both large investor creations and redemptions, and also structural trades by the products themselves. Like any levered or daily inverse product, the very large inverse volatility products and double-levered products buy VIX futures when they are rising, and sell VIX futures when they are falling – exacerbating volatility moves in both directions.

### HEDGING WITH VIX: BEYOND THE BACKTESTS

VIX option strategies continue to draw interest as portfolio hedges because of their deep liquidity (they’re effectively derivatives of the very deep SPX market), their convexity in selloffs, and their strong correlation with risk-off events across markets. VIX-based protection trades, while difficult to manage, have gained fundamental value in this environment. As market selloffs unfold, quick de-risking by hedge funds, lack of liquidity provided by dealers, and flows by VIX products all can drive up the pace of SPX drops and implied volatility spikes. The value of volatility-based hedges has been on the rise – but so has the cost. This has made managing volatility-based hedges important but challenging.

### VIX HEDGES: FUNDAMENTAL TRADEOFFS

Systematic VIX strategies have spawned a mini industry of backtest engineering, in which VIX strategies are tested against their short 2007-14 hypothetical performance aiming to produce the perfect strategy that will work forever. However, the ever-changing environment demands that investors approach VIX hedging with a new lens – focusing on tradeoff management

and economics rather than historical performance. The explosive performance of VIX upside in tail events has strong value – so in some form, owning that protection will come at a cost. Carefully designing VIX trades can pay that price in one of three “currencies”:

- **Currency #1: Negative carry.** The easiest (and likely most expensive) way to carry VIX upside is to suffer the negative carry of the position. Example trades: long VIX calls, long VIX futures.
- **Currency #2: Underwriting downside.** To finance VIX upside participation, take the risk of losses should VIX futures drop substantially. Example trades: Risk reversals, sell straddle to buy two calls.
- **Currency #3: Selling insurance against the “wrong” type of selloff.** Sell protection in some format against modest moves up in volatility, knowing that it’s only the severest events the protection is needed for. Example trades: sell short-dated call spreads to buy longer-dated calls, 1x2 call spreads.

Trades that minimize the use of Currency #1, and instead focus on underwriting other risks, are often called “self-funding” trades, because they aim to be zero-carry in a base case situation. Several option strategies have gained attention as VIX-based hedges. The table below maps investors’ general views on

implied volatility (VIX high or low) and implied volatility-of-volatility (VIX options expensive or cheap) to VIX option trade structures:

		Implied Vol-of-Vol View	
		Vol-of-Vol is Low	Vol-of-Vol is High
Implied Vol View	Vol is Low	Buy longer-dated VIX calls Call calendars (buy short-dated)	Buy VIX future Buy short-dated VIX call Sell straddle to buy two calls Put spread risk reversal
	Vol is High	Calendar strangle Sell short-dated call spread, buy longer-dated call	1 x 2 call spread Long call spread Call spread risk reversal

Source: Deutsche Bank

Institutional investors often alternate among these strategies in an effort to efficiently defend against spikes in volatility. ■

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