

Exploring Volatility With the Inventor of the VIX

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Investing on behalf of clients is a challenge, but it becomes particularly challenging in periods of heightened volatility like what investors have experienced over the past six months. Recall how the stock markets plunged in January before recovering and how in June the Brexit vote sent the markets on a wild ride before they recovered within days — at least the equity indexes; bonds are another matter.

However, as the saying goes, help is on the way in understanding how to measure and potentially profit from market volatility in the form of the inventor of the VIX, Professor Robert Whaley. Based on multiple telephone interviews with Whaley, a review of his academic research and looking at actual market data, we'll see how the "smart money" uses the VIX and suggest ways that advisors can emulate institutions in using the volatility index to benefit clients.

The VIX, or the "fear gauge," as he likes to call it, was created by Whaley, the Valere Blair Potter Professor of Management (Finance) at Vanderbilt University who last year was awarded the William F. Sharpe Lifetime Achievement Award and the Joseph W. Sullivan Award for lifetime contributions to the options industry.

A Ph.D. who formerly taught at the University of Chicago and Duke University's Fuqua School of Business, Whaley has received numerous academic awards over the years while also serving as a consultant to various industry players and exchanges. While you may have a general understanding of the VIX, I would guess that few advisors have the information and insight necessary to profit from it. First, let's look at how the VIX was developed.

The VIX: In Principio

The story of the VIX begins in the early 1990s with the Chicago Board Options Exchange. The CBOE wanted an index that would track the near-term volatility of the stock market for two main reasons. First, it would provide an actual measure of expected short-term stock market volatility. Second, it would provide an index on which futures and options contracts could be written. To accomplish this, the CBOE reached out to Whaley, then at Duke University and with whom the exchange had previously worked. In 1993, the CBOE introduced the [VIX](#), which derives expected volatility, in part, by averaging the weighted prices of out-of-the-money puts and calls.

The CBOE has an exclusive on option activity related to the S&P 500 Index ([SPX](#)) and the S&P 100 Index ([OEX](#)). The CBOE derives a significant portion of its revenue (estimated at 40%) from futures and options written on the VIX.

We should note that this exclusivity does not include options written on SPDR S&P 500 ETF ([SPY](#)). During his research, Whaley also discovered an interesting anomaly. Despite their

similarities, the expected volatility of SPY is curiously different from that of SPX. Why? Whaley suggests two probable causes for this discrepancy.

1. Retail investors tend to purchase SPY options while large institutional investors favor SPX options.
2. Retail investors are more likely to overreact to the flow of information, which is less likely with institutional managers.

The VIX incorporates option prices in its formula. In the beginning, OEX options were used because those options were the most active, accounting for 75% of total index option volume in 1992. In contrast, option activity on SPX was slightly over 16% of the total that year. In his 2008 white paper, "Understanding VIX," Whaley wrote that "critical to the timeliness and usefulness of any implied volatility index (of which VIX is only one) is to have it based on prices from a deep and active index option market."

Since S&P 100 options (OEX) were the most actively traded, it was the natural choice. In the ensuing years, option volume on OEX declined and SPX option activity increased as money managers began to incorporate put options as portfolio insurance. On Sept. 22, 2003, the CBOE replaced OEX with SPX.

Did this shift affect the integrity of past VIX data? No. As Whaley wrote in the same article, from January 1986 through October 2008 the average daily return on OEX and SPX were nearly identical at 0.0263% and 0.0266%, respectively. The standard deviation of their daily returns was marginally different, at 1.182% (OEX) and 1.138% (SPX).

Lastly, their daily correlation was a near-perfect 0.9898 over this period. Whaley concluded that "for all intents and purposes, the S&P 100 and S&P 500 index portfolios are perfect substitutes."

The VIX: How It Works

To understand the VIX, we will begin with a stock index. The level of the S&P 500 Index is determined by the prices of its component stocks, which is a reflection of past price movements. The level of the VIX is derived from option prices on SPX and is forward looking. Although the VIX formula incorporates puts as well as calls, puts have a much greater impact in the formula, more about which later. But this also raises some key questions:

1. Who buys call options?
2. Who buys put options?
3. Which is preferred and by whom?

The answers to these questions are revealing. Whaley observed that:

1. Retail investors tend to purchase call options over put options by a ratio of 2:1.
2. Large institutional money managers tend to purchase put options over call options by a ratio of 2:1.
3. Retail investors use call options primarily on individual stocks.
4. Large institutional managers primarily buy put index options on SPX.

5. The volume of SPX put options is significantly greater than SPX call options

Based on this, we can infer that retail investors and large institutional money managers utilize options very differently.

For example, retail investors tend to buy call options on stocks because they are bullish on a particular company, while large institutional managers employ put options to protect against a market decline. In addition, retail investors tend to overreact to market news while institutional managers tend to avoid these common emotional pitfalls.

When retail investors get nervous about the market, in order to minimize their losses they are more likely to sell (though some will ride it out). Large institutional managers tend to retain their stock positions and protect them with put options.

This leads directly to the question: What makes the VIX rise and fall? Since the price of SPX put options have the greatest impact on the VIX formula, when institutional investors become nervous about the stock market, they buy put options, increasing the volume of those put options, which pushes the VIX higher. Put option prices rise because of greater demand. More specifically, market makers, or those who sell options, prefer to have a similar amount of puts and calls (i.e., they want to remain as market neutral as possible). When demand for SPX put options rises, its price will rise accordingly.

The VIX: Is It Accurate?

How well has the VIX predicted near-term volatility, which was the CBOE's intent? Whaley's research found that, on average, the VIX overstates future realized or actual volatility by about 400 bps. For example, if the VIX was 18.50 on day one, the actual volatility realized over the next 30-day period was 14.50 (again, on average). Of course, there were periods when actual volatility exceeded the VIX, especially during periods of extreme duress (i.e., a spike in fear). The VIX seems to be a reasonably good indicator of near-term volatility.

We know that the VIX accurately measures fear or nervousness in the market, as Robert Whaley argues his research shows, along with independent research. But in the days following U.K. voters' decision to leave the European Union (the "Brexit" vote), I noticed an interesting phenomenon.

On the day after the Brexit vote (June 24), [investors were fearful about Brexit's implications](#), and global stock prices fell sharply on the news. The following Monday, June 27, stocks continued lower, but a curious thing happened with the VIX — it also declined.

This piqued my curiosity. Why would the VIX fall (indicating less nervousness) at the same time stock prices continued lower? Was this an indication that institutional investors, aka, the "smart money," were reducing their put option activity (i.e., insurance), believing the downturn was ending?

From Monday evening through Tuesday morning, U.S. stock futures were strongly positive, indicating a higher opening. As a result, first thing Tuesday morning, I increased the stock

exposure in client accounts. This turned out to be a good decision as stocks began a strong rebound, erasing most of the Brexit losses.

Being curious about this apparent anomaly, I spoke to Whaley that day and shared my thoughts with him. He said there is no strong empirical evidence suggesting that the VIX is a predictive tool for portfolio allocations. He did say, however, that it was very interesting that the VIX and stocks fell simultaneously. Was this actually an anomaly? We'll see.

There are several ETFs designed to track the VIX. Have they been successful? Interestingly, according to Whaley, creating an investment vehicle to accurately track the VIX is basically impossible. If so, why are there financial instruments that attempt this? Additionally, who would invest in them?

According to Morningstar, there are 24 ETFs from six fund families in their volatility category. We will examine nine that either track the inverse of the VIX, use leverage, or track either VIX short-term futures or mid-term futures. All are listed in the table below in descending order of their assets under management, with total AUM of \$4.36 billion as of June 30.

So are these ETFs a wise investment? Most investments contain some degree of risk, but this group takes risk to a new level. For example, in the Credit Suisse ETF prospectus (dated May 4, 2015), for its six VIX-related ETFs, three of which are listed in the table, we find the following admonition: *"Investors should be willing to forgo interest payments and, if the applicable underlying index declines or increases, as applicable, be willing to lose up to 100% of their investment."*

What is the bottom line? These ETFs *are not* suitable as a long-term hold. Rather, they are only appropriate for short-term use, perhaps as short as a single day.

Since it is impossible to invest directly in the VIX, these ETFs buy VIX futures contracts. However, VIX futures contracts behave very differently from the VIX. This situation is similar to an oil ETF (For more on oil ETFs' difficulty tracking their benchmarks, see "[Why Commodity ETFs Have Gone Off Track](#)," Investment Advisor, July 2016). For example, United States Oil Fund ([USO](#)) invests its assets in WTI futures contracts of the nearest, or "front," month and sells the contracts prior to expiration to avoid taking physical delivery of the commodity.

The largest VIX ETF, [VXX](#), divides its assets over the nearest two months' contracts, which we will call M-1 and M-2. As the expiration date of M-1 approaches, to maintain a constant volatility horizon of 30 days (to match the VIX), the fund will move assets from the M-1 contract to the M-2 contract on a daily basis. In addition, just like an oil ETF, these funds are impacted by contango and backwardation. Because VIX futures are in contango 80% of the time, which is a performance headwind, ETFs that attempt to track the VIX have a very difficult time.

The Performance of Long, Short/Inverse VIX ETFs

Figure 1 (*below*) covers the period from Oct. 3, 2011, through June 30, 2016, and contains the six long-only VIX ETFs from the table above, plus the CBOE VIX. The returns shown at the far right of the chart are cumulative returns and not annual. Two of the funds use leverage, which magnifies gains and losses. A cursory glance will reveal why these funds are ill-suited as a long-term hold: The best performer lost 85.6% and the worst lost 100% of the original investment during this period.

Figure 2 (*above*) contains the three inverse or short VIX ETFs and the CBOE's VIX. This chart is a stark contrast to Figure 1's long-only chart. An investor holding an inverse VIX ETF over this period would have done quite well. In fact, the worst performer delivered a total gain of 263.2%, while the best was 388.1%. An even more startling fact is that VelocityShares Daily Inverse VIX ST (XIV) and ProShares Short VIX ST Futures (SVXY) were up close to 900% at their peak, in less than four years, before declining sharply in August 2015. Despite their stellar long-term performance, a word of caution is due. During this period, XIV and SVXY experienced several sharp declines plus a very severe drop in August 2015. In less than 60 trading days, each fund lost over 60% of its value. Careful consideration should be given before investing in these funds.

Do institutional money managers invest in VIX ETFs? The short answer is yes, but with an important caveat. According to Whaley, large institutional managers tend to short long-only VIX ETFs or invest in an inverse fund. This observation is not difficult to understand considering the performance numbers shown above.

The VIX: How Advisors Should, and Should Not, Use It in Client Portfolios

There are several issues to consider before investing in this type of security. First, we should note that the average level of the VIX from inception (Jan. 4, 1993) through June 30, 2016, was 19.90. If the VIX is below its historical average, it simply means that near-term risk is below average. However, this can quickly change.

Equally important may be its rate of change. If the VIX rises during a trading session, even if it remains below average, it signals an increase in put option activity. Thus, it may be an indication that institutional money managers are growing more nervous.

The VIX is a complex index with multiple uses. It is a relatively accurate measure of expected near-term stock market volatility. It also provides insight into what large institutional investors are doing since put options on SPX are dominant in the VIX formula.

While it is practically impossible to create a financial instrument that will accurately track the VIX, investors who buy and hold a long-only VIX ETF are guaranteed to lose most, if not all of their investment.

Finally, institutional investors tend to short long-only VIX ETFs or buy an inverse ETF. When investing in a VIX ETF, consider how large institutions use them to invest in volatility. Be very careful, as large price fluctuations are not just possible, but likely.