Is a VIX ETP an Investment in the VIX?

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Draft Date: 06/12/2015

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Abstract

This paper examines VIX-based ETPs (exchange traded products) and illustrates that both the return and risk of these products are not related to the return and risk of the VIX index. The authors note that VIX ETPs do not correlate well to the VIX index. In fact, these funds are not even designed to have a high correlation to the VIX index. Individual investors can often mistake VIX ETPs for an investment in the VIX index itself, which is incorrect and may lead to a costly mistake.

Keywords: VIX index, ETFs, ETPs

JEL classifications: G11, G12

Is a VIX ETP an Investment in the VIX?

The VIX index measures volatility in the equity market and is a good measure of investors' overall sentiment and level of fear in the stock market. The VIX index is able to gauge market expectations of equity performance by tracking the demand for put and call options, though extracting the "price" of implied volatility in option prices of S&P 500 index options. Boscaljon, Filbeck and Zhao (2011) even note that the VIX index can be used to time changes in rebalancing between value and growth stocks.

There are a number of VIX-related terms in the financial press that individual investors may encounter. The authors of this paper use care to distinguish between these terms, which may include: the spot "VIX index", VIX-based Exchange Traded Products ("ETPs" or "funds"), VIX futures or options, and the S&P 500 VIX Futures Index ("S&P ST Index"), among others. A common mistake that is often made by individual investors looking to gain exposure to the VIX index (or equity volatility in general) is to assume that VIX exchange traded products (ETPs) accurately track the VIX index. VIX-based ETPs are not structured to track the spot VIX index, but are designed to track the S&P ST Index or other related indices that themselves are not well correlated to the VIX index. The purpose of this paper is to examine the differences between VIX-based ETPs and the VIX index and to serve as a guide and a warning to individual investors about how these products trade.

It is important to note that the VIX index is not a tradable asset. Investment products that are tradable include VIX futures, VIX options, and VIX-based ETPs (see Dzekounoff, 2010; Jones, 2011; Jones & Allen, 2015; Moran & Dash, 2007; and others for a discussion of VIX futures and options). The products that have been introduced over the years are designed to offer

investors exposure to the volatility but to not mimic the performance of the VIX index. The only vehicles that these products can use is to invest in VIX futures (and possibly VIX options, which most ETPs do not use). These VIX-based ETPs are created from complex strategies and investors must beware of the risk involved in trading these particular assets.

In an effort to diversify their portfolio, individual investors may seek investment vehicles to hedge against downside moves in the equity market. Since volatility, and the VIX index specifically, tends to rise when investors become more pessimistic, an investment in volatility can be a good thing, especially as a short-term hedge. Thus, VIX-based ETPs can act as a good hedge against a drop in equities. Allocating a small portion of a portfolio in volatility could help protect investors from a sudden drop in the market. VIX-based ETPs have become more popular, and thus new ETPs are being created and issued. Prior to these products, individual investors and certain institutions were unable to gain exposure to volatility, because they may have been unable to invest in VIX futures. This could be due to restrictions placed on certain institutions and individual investment accounts. Now these same individuals and institutions can now invest in ETPs that have VIX futures held in trust.

Empirical evidence presented in Whaley (2013), who is known as the "father of the VIX (see Whaley, 1993)," and others show that investing in VIX-based ETPs is not prudent for a buy-and-hold strategy. The VIX futures market is frequently in contango, meaning that the price curve for futures contracts slopes upward, resulting in a decay of the price of the VIX futures contracts as they near maturity. This reduction in VIX futures prices, thereby reduces the prices of the ETPs that hold these futures. Whaley (2013) found that the price curve for futures sloped upward "80 percent of all trading days for futures with 30-day maturities." And that, "this erosion happens because the price of longer-dated futures contracts is almost always higher than

the price of shorter-dated futures contracts." Most companies that sponsor VIX-based ETPs note in the prospectus that these funds will guarantee that an investor will lose all of his or her money if a buy-and-hold strategy is used over the long term. However, many individual investors may overlook this fact.

Most VIX-based ETPs are designed to replicate the one-day return of the S&P 500 VIX Short-Term Futures Index ("S&P ST Index"). This index underlying the ETPs is structured to provide a constant 30-day maturity futures position by rolling a long position in the first and second next to mature monthly VIX futures contracts. Thus, each day, the S&P ST Index adds exposure in the second month to mature VIX futures contract and decreases exposure in the next to mature contract to provide this constant 30-day maturity. Jones (2011) discusses investing in the nearby (next to mature) VIX futures contracts and shows the damaging effects on a portfolio of a buy-and-hold strategy along with how poorly VIX futures track the VIX index. Lu, Wang, and Zhang (2012) examine leveraged and inverse ETFs and note how, over time, these products do not accurately track the leveraged or inverse return of the benchmark they are deigned to mimic.

Specifics of VIX-Based ETPs

ETPs include exchange traded funds (ETFs) and exchange traded notes (ETNs). This section discusses the similarities and differences of ETFs and ETNs and also notes which VIX-based ETPs are classified as ETFs and which are classified as ETNs. As shown in the next section, none of these funds precisely track the VIX index, since the assets underlying the ETPs are VIX futures contracts.

Most VIX-based ETPs are futures based, and the index they are replicating is usually the S&P ST Index, which is not the VIX index but an index created using VIX futures contracts. The VIX-based ETPs (in order to replicate the S&P ST Index) must then constantly sell the current month futures and buy the subsequent month futures, in order to keep the constant 30-day maturity. Because the VIX futures price curve tends to be in contango (i.e. slope upward and becoming more expensive with maturity), the value of the ETPs will deteriorate over time, due to the purchasing of higher priced second month out contracts and selling of the current month. Thus, there is usually a built in "buy high, sell low" trade embedded in these funds. One ETP in our sample (VXZ) replicates the return of the S&P 500 VIX Futures Mid-Term Index, which is constructed in a similar manner to the S&P ST Index, though uses a 5-month constant maturity, rather than a constant 30-day maturity.

While VIX-based products are not prudent for buy-and-hold strategies, Jones (2011) shows that investing in VIX futures in a tactical manner could lead to positive returns, if executed correctly. VIX-based investment vehicles, however, do have to be carefully monitored, and investors should determine individually if it is wise to invest in these products. Thus, since VIX-based ETPs are futures based, the investor in these products should understand, at a minimum, the relation between the ETPs and the VIX index, upon which these investments eventually settle upon. This study examines this question, how closely VIX ETPs really track the VIX index. The next section presents an examination of eight ETP individually and noting the differences between each ETP. The following then compares the returns of these ETPs against the returns of the VIX index to determine if the ETP returns do in fact track the returns of the VIX index and to what extent.

VIX-Based ETPs Used in this Study

There are a variety of ETPs that have been introduced over the past decade that provide investors with an opportunity to invest in volatility. This study examines the VIX index returns compared to individual VIX-based ETP returns from October 4, 2011 through December 31, 2014. This time period was selected because some of the ETPs included in the study were not listed for trading until October 4, 2011. The eight ETPs we choose to examine are examined in Whaley (2013). Four of these ETPs seek to yield the daily return of a VIX-based index. VXX, VIIX, and VIXY replicate the S&P ST Index, and VXZ replicates the S&P Mid-Term Index. Two funds (XIV and SVXY) seek to yield the inverse daily return of the short-term index, and two ETPs (TVIX and UVXY) seek to provide twice (2x) the daily return of the S&P ST Index. The specifics of each ETP is discussed below.

- VXX – iPath S&P 500 VIX Short-Term Futures ETN

The first VIX-based ETP introduced and the most popular VIX ETN is VXX. VXX is an exchange traded note that attempts to replicate the S&P 500 VIX Short-Term Futures Index Total Return. This ETN follows the mechanics of the S&P 500 VIX Short-term futures index, as noted above, by rolling long position in the first and second month VIX futures contracts each day.

- VXZ – iPath S&P 500 VIX Mid-Term Futures ETN

VXZ is much like VXX but tracks the S&P 500 VIX Medium-Term Futures Total Return Index, which has an average settlement date of five months. The iPath S&P 500 VIX Mid-Term Futures index continuously rolls long positions in the 4^{th}, 5^{th}, 6^{th} and 7^{th} next months to settle VIX futures contracts.

- VIIX – VelocityShares VIX Short-Term ETN

Like the VXX, the VIIX seeks to replicate the return of the daily performance of the S&P 500 VIX Short-Term Futures index. The index was designed to provide investors with and unleveraged exposure in short-term futures contracts.

- XIV – VelocityShares Daily Inverse VIX Short-Term ETN

The XIV attempts to replicate the inverse performance of the S&P 500 VIX Short-Term Futures index and provides investors with (-1x) exposure to the short-term index. When the S&P 500 VIX Short-Term Futures index goes up, the XIV returns go down and vice versa.

- TVIX – VelocityShares Daily 2x VIX Short-Term ETN

The TVIX is a leveraged ETN that is linked to a multiple (2x) of the daily return of the S&P 500 VIX Short-Term Futures index. The TVIX tries to replicate the performance of two times the short-term index. The leveraged component makes the TVIX a riskier investment than the VXX.

- VIXY – Proshares VIX Short-Term Futures ETF

The shares comprised in the VIXY ETF make up what is called the "Matching Fund". The Matching Fund attempts to match, before fees and expenses, the performance of the S&P 500 VIX Short-Term Futures Index.

- UVXY – Proshares Ultra VIX Short-Term Futures ETF

The shares comprised in the UVXY ETF make up what is called the "Ultra Fund". The Ultra Fund attempts to achieve results, before fees and expenses, that are two times (2x) the performance of the S&P 500 VIX Short-Term Futures Index each day.

- SVXY – Proshares Short VIX Short-Term Futures ETF

The shares comprised in the SVXY ETF make up what is called the "Short Fund". The Short Fund seeks results, before fees and expenses, that correspond to the inverse (-1x) of the performance of the S&P 500 VIX Short-Term Futures Index on a daily basis.

Five of these ETPs are exchange trades *notes* (ETNs) and three are exchange traded *funds* (ETFs). There are slight differences between the structures of VIX ETNs and VIX ETFs that individual investors, in particular, must be aware of. ETNs, in general, promise to match the return of the underlying index. Because they are notes, similar to bonds, the creditworthiness of ETN issuers is important. ETNs are structured as debt instruments with a maturity date. ETFs, on the other hand, pool together funds from investors and then use these pooled funds to invest in securities in an attempt to match the performance of an index. Shareholders do not directly own the underlying investments in the fund, but they own shares of the fund, so indirectly own the underlying assets.

Is a VIX ETP an Investment in the VIX?

In order to determine if VIX ETPs truly replicate an investment in the VIX index, and if so how much, this section compares the daily returns of each ETP with the returns of the VIX index. Since the VIX index is not tradable, it is important to distinguish whether or not an investment in a VIX-based ETP is a true substitute for an investment in the index. Many investors may assume they are gaining highly correlated exposure to the VIX index when purchasing a VIX ETP, when they may not. As mentioned previously, our study analyzes data from October 4th, 2011 through December 31st, 2014.

Figure 1 shows the VIX index, over the period of analysis, compared to the unlevered ETPs (VXX, VXZ, VIIX, and VIXY). One can see that none of these ETPs track the VIX index very well over time. All three ETPs that follow the S&P ST Index (VXX, VIIX, and VIXY) are very highly correlated with each other. In fact, the three series are not distinguishable from each other in Figure 1. These funds begin at a base of 1.00 in October 2011 and end at a value of 0.04

in December 2014, while the VIX index goes from 1.00 to 0.47, during the period. Thus, a buy-and-hold strategy in these funds would be devastating to an investor. VXZ, the fund that follows the mid-term index, fares a bit better than the short-term ETPs, going from 1.00 to 0.18 over the period, but still ended no where near the VIX index. In addition, one can see that the volatility of none of these funds matches that of the VIX index.

[Figure 1 about here]

Examination of Figure 2, show the two inverse ETPs (XIV and SVXY) versus the VIX index. One can see that these two funds performed very well over the period, going from 1.00 to 5.70 (XIV) and 5.81 (SVXY), while the VIX index goes from 1.00 to 0.47. This performance is in large part due to the contango effect of VIX futures, mentioned previously, and the fact that these funds are inverse, effectively shorting the S&P ST Index. Even though the returns of these ETPs were very high (around 71% compounded annual return), individual investors should use extreme caution when looking to invest in inverse VIX ETPs. As shown in Figure 2, the VIX index did decline over this period, contributing to the increase in these funds. However, the VIX index does increase at times, which causes these inverse funds to decline significantly.

[Figure 2 about here]

Figure 3 presents the two levered/2x ETPs (TVIX and UVXY) against the VIX index. As one would expect, given the performance of the 1x funds, these levered ETPs performed even worse, going from a base of 1.00 to 0.0003 over the period. As is also evident from Figure 3, these funds do not follow the VIX index either. Thus, an individual investor may choose to invest in one of these levered/2x funds but should definitely not do so with the intention of holding the fund over a long period of time. These funds can be bought and sold over a short period to take advantage of an increase in volatility, but investors should know the risk – that

these funds do not track the VIX index and have a strong downward tendency, due to the contango effect of VIX futures that is magnified with their leverage.

Table 1 provides statistics of the VIX index versus the eight ETPs over the examination period. Panel A considers all daily data; Panel B looks at only the days the VIX index goes up, and Panel C only the days when the index goes down. Table 1, Panel A shows that the VIX index had an average daily return of 0.15%. Even though the VIX index had an average positive return, all of the VIX ETPs, except the inverse funds, experienced negative daily average returns. The differences in the index returns and the returns of the ETPs demonstrate the effect of contango that that these ETPs experience and further illustrate why these ETPs are not suitable for a buy-and-hold strategy. In addition to the differences in average returns, Panel A also shows the median returns of the index and ETPs. The VIX index had a -0.35% median daily return over the period, while the three short-term ETPs (VXX, VIIX, and VIXY) had median returns of -0.52%, -0.54%, and -0.52%, respectively. The returns of these ETPs are correlated, but only about 88% correlated to the VIX index. The two inverse ETPs (XIV and SVXY), while replicating the inverse returns of the VIX short-term index had median returns of 0.51% and 0.54%, respectively. The two levered/2x ETPs (TVIX and UVXY) both posted median returns of -1.08% (or median returns of -0.54% if they were unlevered), while the mid-term ETN (VXZ) had a median return of -0.23%. Individual investors must be aware that over time, the value of these VIX ETPs tends to significantly decline or decay.

[Table 1 about here]

Table 1, Panel B presents the statistics of the VIX ETPs relative to the VIX index on the days in which the VIX index had a positive return. When looking at the days in which the VIX index experienced a positive return, it averaged 5.60% daily, with a 3.85% median return. On

the days the VIX index moved up, many of the VIX ETPs moved in the same direction, however none had average daily returns or median returns as high as the VIX index. For example, VXX experienced an average return of 2.35%, compared to the 5.60% for the VIX index. In addition, VXZ, the mid-term ETN, only generated an average return of 0.97% on the days in which the VIX index had a positive return. The non-inverse ETPs that track the S&P ST Index (VXX, VIIX, TVIX, VIXY, and UVXY) only had positive returns 77%-79% of days in which the VIX index had a positive return.

Table 1, Panel C reports the statistics the VIX ETPs in relation to the VIX index on days in which the VIX index experienced a negative return. These findings are telling and exemplify the issues related to investing in VIX ETPs. On the days in which the VIX index had a negative return, it averaged a daily return of -4.60%. For the days in which the VIX index had a negative return, only the twice-levered ETPs (TVIX and UVXY) experienced a greater downward average daily return than the VIX index of -4.81% and -5.32%, respectively. Not surprisingly, during these days, the inverse ETPs (XIV and SVXY), on average, moved in a positive direction. However, there were still trading days in which the inverse VIX ETPs moved in the same negative direction as the VIX. The non-inverse funds that follow the S&P ST Index (VXX, VIIX, TVIX, VIXY, and UVXY) were more highly likely to follow the VIX index when it was down; all were down over 90% of the days when the VIX index was down. Thus, Panel C illustrates that while, on average, many of these funds did not post as large of a negative a return as the VIX index, when coupled with the negative average daily returns of these ETPs when the index went up, the overall performance was much worse than that of the index. This result is also shown in Figures 1 and 3 (excluding the inverse funds).

Analyzing the returns in the VIX-based ETPs versus the returns in the VIX index is noteworthy. One might expect these VIX-based ETPs to act as fair substitutes for investing in the VIX index, but, as noted above, these funds do not accurately track the VIX index. Even though these investments do not track the VIX index well over time, they still generally move with volatility (but are more correlated with the appropriate S&P 500 VIX Futures Index). Thus, investors can use these ETPs to benefit from changes in volatility but should only invest for a short period. Since these funds are not prudent for a buy-and-hold strategy, timing in these investments is critical. Investors must consider the benefits, costs, and challenges of investing in VIX ETPs and must also realize that the VIX ETPs do not always move in the same direction as the VIX.

Conclusion

This paper examines eight VIX-based exchange traded products (ETPs) that include exchange traded notes (ETNs) and exchange traded funds (ETFs) and compares the performance and returns of these investment vehicles to that of the VIX index. Many investors may expect these ETPs to track the VIX index, which this paper shows that they do not. In addition, many investors may expect that these funds are designed to replicate the returns of the VIX index, which they are not. These funds are structured to replicate the performance of any number of indexes comprised of VIX futures. This paper looks at ETPs designed to replicate the performance of two different indexes, the S&P 500 VIX Short-term Futures Index and the S&P 500 VIX Mid-term Futures Index. In addition, ETPs that track the inverse and twice the performance of the S&P 500 VIX Short-term Futures Index are examined.

The results of this analysis are crucial for individual investors looking to invest in VIX-based ETPs (or any other VIX-based products). Investors should realize that the returns of ETPs, while providing exposure to volatility, do not track the VIX index and are exposed to a decline in value, due to the large degree of contango priced into the VIX futures contracts used by these funds. Thus, VIX ETPs are not suitable for a buy-and-hold investment and should be carefully monitored if used in any capacity in a portfolio. In this same manner, Dilelio, Hesse, and Stanley (2014) also note that inverse and leveraged ETFs are generally not suitable for long-term passive investment strategies.

VIX-based investment products are still relatively in their infancy, especially ETPs, and research into these products is just beginning. There are a number of questions that can be examined within the VIX-based investments space. This paper adds to that literature and provides a general overview and warning to individual investors of how VIX ETPs behave and some of the factors that must be considered before investing in these products. There is much more research to be done in this area and many more ways to examine using these types of products within an investment strategy, just not from a buy-and-hold perspective.

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Table 1 – Returns of VIX Index versus ETPs

	VIX Index	VXX	VXZ	VIIX	XIV	TVIX	VIXY	UVXY	SVXY
Panel A: All Data									
Average	0.15%	-0.33%	-0.19%	-0.33%	0.29%	-0.74%	-0.33%	-0.70%	0.29%
Median	-0.35%	-0.52%	-0.23%	-0.54%	0.51%	-1.08%	-0.52%	-1.08%	0.54%
SD	7.04%	3.81%	1.85%	3.83%	3.80%	7.00%	3.82%	7.60%	3.82%
Correlation	n/a	88.41%	76.99%	88.56%	-87.89%	85.28%	88.55%	88.42%	-87.93%
Panel B: Days when VIX was up									
Average	5.60%	2.35%	0.97%	2.36%	-2.39%	3.95%	2.36%	4.63%	-2.39%
Median	3.85%	1.52%	0.72%	1.52%	-1.65%	2.54%	1.57%	3.05%	-1.62%
SD	5.91%	3.25%	1.59%	3.27%	3.25%	6.15%	3.26%	6.49%	3.27%
% both up	n/a	78.99%	72.61%	77.66%	22.07%	78.99%	78.99%	77.39%	22.61%
Panel C: Days when VIX was down									
Average	-4.60%	-2.65%	-1.19%	-2.66%	2.60%	-4.81%	-2.66%	-5.32%	2.61%
Median	-3.59%	-2.16%	-1.07%	-2.13%	2.11%	-3.80%	-2.15%	-4.25%	2.11%
SD	3.82%	2.56%	1.43%	2.58%	2.55%	4.86%	2.56%	5.10%	2.56%
% both down	n/a	90.28%	81.48%	90.05%	10.88%	90.05%	90.28%	90.05%	11.11%

Note: Data from October 4, 2011 through December 31, 2014. VXX, VIIX, & VIXY replicate the S&P 500 VIX Short-Term Futures Index. VXZ replicates the S&P 500 VIX Mid-Term Futures Index. XIV & SVXY replicate the inverse, while TVIX & UVXY replicate 2x of the S&P 500 VIX Short-Term Futures Index.

Figure 1
VIX Index vs. Short-term and Mid-term ETPs

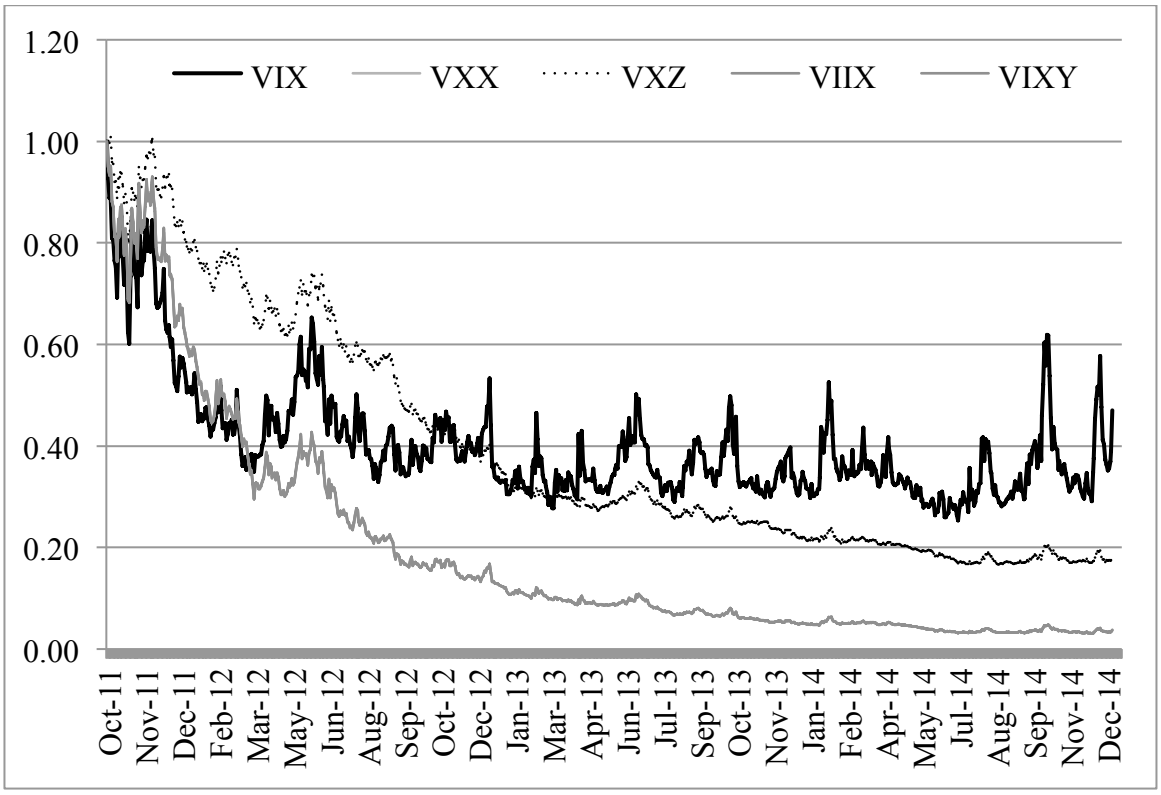

Figure 2
VIX Index vs. Inverse ETPs

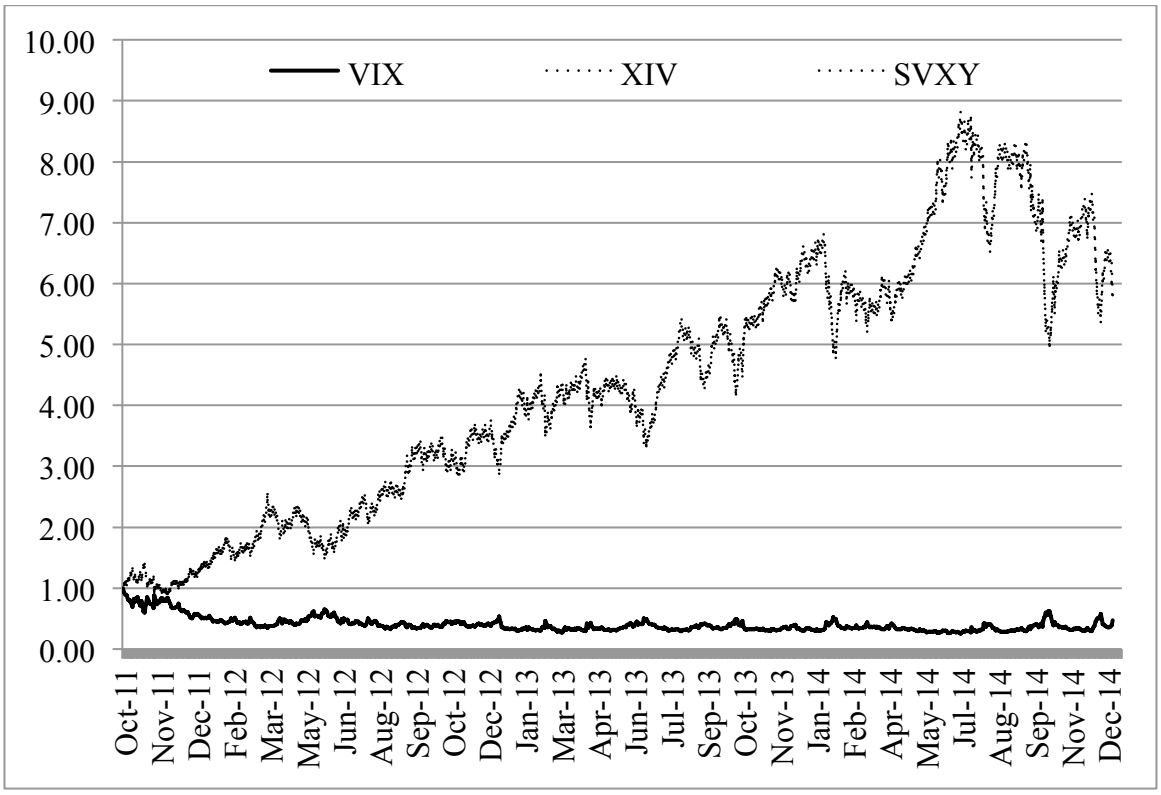

Figure 3
VIX Index vs. Levered/2x ETPs