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Buyer Beware: Investing in VIX® Products

VIX[1] based products have become very popular in recent years and many people identify the VIX as an investor fear gauge. Products based on the VIX are generally marketed as a simple means to hedge portfolios. However, most investors do not truly understand the VIX or products based on the VIX. Despite the ease with which they can be traded, these products are very complex derivative instruments. In this article we highlight several technical issues that create additional risk for investors who use these products. Given these issues and their costs, we find VIX based investment products inappropriate for most retail investors.

Background

The VIX was originally created by the Chicago Board Options Exchange (CBOE®) in 1993 as an index to gauge near-term (30-day) volatility. At that time, the concept of trading volatility as an asset was emerging amongst professional traders. About a decade later the index calculation was altered so that products based on the VIX could be more easily traded. Futures on the VIX began trading soon after. Several years after the VIX futures were released and became more liquid, some dealers began selling exchange traded notes[2] (ETNs) based on the VIX and VIX futures. This effectively opened the door for retail investors to speculate on volatility since these ETNs are traded on exchanges just like stocks.

Figure 1: Value of a $10,000 investment in the VXX since it was released (January 2009)

Source: Bloomberg

[1] The VIX (or CBOE Volatility Index®) is an index that uses S&P 500 index option prices to estimate volatility over the next 30 days. It was originally based on the S&P 100 index.

[2] Exchange traded notes (ETNs) are similar to ETFs in that they generally seek to replicate a given index or benchmark. However, ETNs are not necessarily backed by physical assets. Instead, they are guaranteed by their issuer and this subject to the credit risk of that counterparty.

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The Good

In our view, the main benefit of VIX based products is that they create a new class of volatility related investments. Volatility is negatively correlated with the equity markets and does not behave like traditional assets. In particular, it has a tendency to spike up but generally requires more time to drift lower. This asymmetric nature of volatility leads many to consider it a valuable asset for diversifying portfolios.

While we believe the embedded costs of these products far outweigh the benefits for most investors (ie, those who hold them for longer than a day), day traders may be able to leverage these new products without falling prey to their holding costs. In any case, investors should attain a solid understanding of the product and its true costs before putting their capital at risk with these new instruments.

The Bad

In a nutshell, we believe that VIX based products are highly complex and should only be used by professional investors who understand their risks of these derivatives. In the following, we explain what we believe to be the major pitfalls with respect to the VIX products (futures, ETNs, and options). Most of these points are technical in nature but we attempt to summarize them as intuitively as possible. The last point, however, is the most subtle and also the most technical. Accordingly, we describe it in the following section ("The Ugly").

- Bait and switch: The VIX has many attractive characteristics that are often highlighted while promoting VIX based products. It never goes to zero, its appears to be range-bound, negative correlations with equities, etc. However, the VIX itself is not the asset being traded. Futures, options, or ETNs are the products that investors put money into and their costs are not included in the VIX itself.
- Costs: Many of these ETNs charge management costs on the order of 1% per year. That may appear fair given the tedious and technical requirements to hedge these products. This does not include the much more significant costs that are embedded in the futures (which ETNs typically invest in). The VIX's rebalancing calculation rolls shorter dated options contracts into the longer dated options without imposing a cost. However, the options the VIX and its futures are based on embed a time value that erodes with each passing day. This is why any long-term chart that maintains constant exposure to VIX futures goes down. Presumably, this is why the creators of some ETNs included specific contractual clauses which allows them to reverse split the share price so it does not end up trading like a penny stock.
- Term structure: Traditional futures contracts are based on the cost of delivering the underlying asset at some later date. So the future price is approximately the cost of

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the asset today, plus interest and any cost of carry[3]. In effect, the asset is the same asset but is received at a later date. In the context of VIX futures, the asset being purchased in volatility over particular period of time, say the month of October. In July this period is three months out, but in September it is only one month away. This asset effectively slides down the term structure for volatility. This is actually just another way of observing the cost imposed by the loss of (options) time value, but again highlights the very complex nature of these instruments.

- Settlement: The VIX futures settlement is based on the value of the VIX at expiry. The value of the VIX is based on options prices and these option prices are based on people's perceptions of the future. No real asset is ever realized or received. This further opens the door for potential manipulation of settlement prices.
- Conflict of interest: ETNs are often traded and hedged by the same traders who make markets in the underlying VIX futures as well as the (S&P 500) options the futures are based on. Conceivably, traders who hold the opposite side of a position (the retail market is generally long VIX based ETNs) may be inclined to manipulate settlement prices in their favor.

The Ugly

Despite the name of this section, this issue is not necessarily worse than the others mentioned above. It is, however, much more mathematically in depth and thus considered an ugly topic by many. Accordingly, this discussion involves more technical content.

At the root of this issue is the difference between volatility versus variance (volatility squared). Many readers may be familiar with the basic concept of volatility or standard deviation. Some may even recall how the standard deviation relates to the normal or bell-shaped curve (Gaussian distribution for fellow engineers) and measures how wide a distribution of numbers might be. There are several rules of thumb regarding normal distributions and how much of the distribution fits between plus or minus one, two, or three standard deviations (hint: approximately 68, 95, and 99%, respectively). However, few people are likely to have much intuition regarding variance except perhaps its basic definition; variance is simply volatility squared.

So why is variance even relevant? Going back more than a decade, trading volatility was becoming more popular on Wall Street and traders were using options as a vehicle to do so. However, the strategies required to trade volatility were tedious, time consuming, and incurred significant transaction costs (frequent buying and selling of options). So the banks invented a product called a volatility swap that allowed investors to easily speculate on future levels of volatility while they took care of the hedging

[3] In the case of a physical asset, the cost of carrying the asset may relate to storage and security costs. For a paper asset like a stock or bond, the asset may pay cash flows in the interim and make the cost of carry negative (ie, the holder of the asset gets paid to hold it).

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details with their economy of scale. The result was that a client could buy (or sell) volatility over a specified period for a price. At the end of that period, if the volatility was higher, then the dealer would pay them the difference. If it was lower, the client owed the dealer the difference. It was that simple.

Example: A client buys $100,000 units of volatility at 20% on a particular index. The contract starts that day and ends three months later. At the end of that period, the volatility is measured and turns out to be 24%. So the bank pays the client (24-20) x $100,000 = $400,000.

After some investigation and research, the banks discovered that they could offer a similar product, variance swaps, that did not require all of the tedious work and expensive transaction costs[4]. Instead of speculating on a volatility figure like 20%, this contract was based on variance figures like 400 (for $20\%^2$). Given the less intuitive feel for variance figures, variance swap contracts were generally quoted in terms of volatility swaps for convenience (ie, the client would specify a volatility level for the price and a vega exposure[5] (P&L per %-point of volatility).

Example: A client buys $2,500 variance units at 400 ($20\%^2$) on a particular index. The contract starts that day and ends three months later. At the end of that period, the volatility is measured and turns out to be 24%. So the variance is 576 ($24\%^2$) and the bank pays the client (576-400) x $2,500 = $440,000.

As seen in the two examples above, the mathematics of the payoffs lead to different results ($400K vs $440K). More generally, it can be proven mathematically that the payoff of the variance swap is ALWAYS higher than the payoff for the volatility swap at the same price (ie, volatility level). If the volatility swap makes money, the variance swap would make more. If the volatility swap loses money, the variance swap would lose less. This is a critical difference between the volatility and variance payoffs.

This leads to an issue with volatility futures contracts based on the VIX. The calculation of the VIX is based off of a formula for variance. However, the futures contracts trade in terms of volatility. Accordingly, the VIX futures will always be worth less than the equivalent variance swaps (at the same price) since they always pay less.

We suspect the creators of the VIX futures based the product on volatility rather than variance because volatility figures are more familiar and intuitive than variance figures. Given all of the other complexities described above, forcing market participants to understand variance units might have made marketing the product too difficult. So the end result is a complex product that only professional traders can truly understand.

[4] For an in depth mathematical discussion of this topic I suggest reading http://www.ederman.com/new/docs/gs-volatility_swaps.pdf.
[5] The variance units may be estimated by the desired vega divided by twice the volatility level.

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Conclusion

Given the incredibly technical nature of VIX based products and their less apparent costs (constantly diminishing time value of options), we do not believe VIX based products are appropriate for most retail investor.

In our view, the Commodity Futures Trading Commission (CFTC) should not have allowed these products to reach the retail market. The CFTC used to claim that they would only allow new futures to be listed if they were based on tangible underlyings and added transparency to the markets. While we could no longer find these stipulations on the CFTC website, they do still maintain that futures should not be susceptible manipulation. We find that futures based on the VIX fail all of these tests.

Investors interested in hedging their portfolios should consider various strategies to do so. Diversification is a good starting point, for example. However, for more advanced strategies that involve options or the VIX, we strongly suggest consulting a qualified advisor that has experience with these instruments and can find suitable solution.

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