THE LONG AND SHORT OF VOLATILITY

Use volatility arbitrage to hedge—but watch out for the gaps.

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One of the key determinants of an option's value is the estimate of how volatile the underlying share is going to be over the life of the option. When an option trades in the market, the price of the option implies a certain volatility necessary to produce that value.

A market neutral trading strategy employed by some hedge funds involves trading the implied volatility, known as volatility arbitrage. If an option is trading with a low implied volatility (i.e., is "cheap" and has a low option value), then it should be possible to buy the option, hedge it by short-selling the underlying shares, and lock in arbitrage profits over time as the actual volatility exceeds the implied volatility. Similarly, if an option is trading with a high implied volatility (i.e., is "expensive" and has a high option value), then it should be possible to sell the option, hedge it by buying the underlying shares, and lock in arbitrage profits over time as the actual volatility is less than the implied volatility.

The hedging ratio, or the delta, is the ratio of shares long or short necessary to hedge one option. The Black-Scholes option pricing model specifies this delta so that by trading the underlying shares according to the predicted delta, arbitrage profits can be captured with low risk. However, this model (as with most models) employs some necessary simplifying assumptions that are not true in practice. One key assumption is that market prices are continuous and the delta adjustments can also be made continuously. Unfortunately, markets gap, particularly during periods of market stress—making delta adjustments discontinuous.

To see the impact of these gaps, let's first look at the delta curve. If the underlying share price is well below the option strike price, then the option value is very insensitive to the share price—i.e., the delta is very close to zero. If the underlying share price is well above the option strike price, then the option value will move almost dollar-for-dollar with the share price—i.e., the delta is very close to one. In between, delta follows a smooth positively sloped curve.

The impact of this type of curve is as follows. If the position is long one option and short delta shares, then if the share price falls, the delta will decrease. Shares will therefore have to be purchased to reduce the delta. Conversely, if the share price rises, shares will have to be sold. Buying in falling markets and selling in rising markets is the most desirable position to be in.

The consequences of market movements are reversed if the position is short one option and long delta shares. In this case, you are buying in rising markets and selling in falling markets. Less desirable, but if it can be done continuously in liquid markets it shouldn't be too bad.

Interesting things start to happen when gaps and illiquidity are introduced. If a market gaps down (think of any number of recent scandals), and your position is long one option and short delta shares, you get two advantages. You get to do your entire delta adjustment at the new low price (i.e., buy shares at the low price instead of continuously buying on the way down) and you get to be a buyer in a market full of sellers. If your position was short the option and long delta shares, you are in some trouble: you have to do your delta selling all at the low price and you have to compete with all the other sellers. In fact, your selling pressure if your position is large enough can drive the shares even lower, making your losses larger.

In the real world, even if you are following the Black-Scholes model to hedge, you never fully hedged. You are exposed to differences between actual volatility and implied volatility, and trading distortions caused by market gaps and illiquidity. In general, however, a long option position can earn extraordinary profits and a short option position can produce extraordinary losses.

The lesson here is to look for hedge funds that have a bias towards long option positions. ▮