The evolution of variance

Liquidity of variance swaps – contracts where the cash payout is equal to the notional multiplied by the difference between the realised variance of the underlying and a pre-agreed variance strike over the life of the swap – has increased dramatically in the past nine months. "We believe the market for variance swaps is more than €1 billion in vega this year," says Richard Carson, Deutsche Bank's London-based global head of structured products trading. Vega measures the change in an option's price caused by changes in volatility, and €1 billion in vega at an estimated average duration of nine months would represent about €300 billion of equivalent options notional.

Variance swaps have proven popular because, unlike options, which provide exposure to both the underlying price and its volatility, they give pure exposure to volatility alone. So, investors are able to easily gain exposure to the future levels of volatility, as variance swaps are forward contracts on annualised variance – the square of volatility. And hedge funds and other financial institutions have actively traded packaged dispersion trades using variance swaps.

Dealers are creating a range of new variance-related products as investor interest in volatility products is burgeoning. But the jury is still out on whether instruments such as 'up-var' swaps and 'gamma' swaps will take off. By Christopher Jeffery

These trades exploit pricing discrepancies between index options and the price of their constituent stock options. These 'vega-spread' transactions are used by hedge funds to gain relative value – for example, by buying a 20-stock sub-basket of an index such as the Eurostoxx 50 and shorting the remaining names. When this is packaged in a variance format, investors do not need the large margin requirements and delta-hedging capabilities required to conduct vanilla option dispersion trades.

This increased popularity of variance swaps has caused dealers to look at more specialised trading instruments and strategies to take the market to its next stage of evolution. One of these instruments is the variance option. Merrill Lynch was an early proponent of variance options, and was pushing the instruments into the market about two years ago. Since then, a number of equity derivatives dealers, including Bank of America and Credit Suisse First Boston, have entered the market.

Michael Wexler, founder of London-based hedge fund Maple Leaf Capital, says the variance options market is still

highly illiquid, and he is aware of no more than 10 trades that have been conducted. But Alastair Beattie, London-based managing director in the hedge fund group at SG, says variance options liquidity has increased dramatically. "It was once a market where we traded sporadically on specific interests, but more recently we have been able to execute crosses between clients, as we've seen two-way interest."

The products creating the biggest stir, however, have only emerged in the past few months. SG is promoting 'up-var', or 'up-vol' swaps, while Deutsche Bank and BNP Paribas are actively touting 'gamma swaps'. And it is not surprising that structured product houses are keen to get these products off the ground. Structured product providers are generally short skew risk from selling structured products. For example, they have sold many out-of-the-money puts on single-name stocks or baskets of stocks – so-called 'worst-of' baskets. Investors have also sold out-of-the-money calls in return for premium. This means volatility for low strikes has increased but volatility for high strikes has decreased (*see chart*). The new variance instruments are designed to buy skew back from hedge fund clients and deal with part of their trading book axes to free capital to write new structured products deals.

"Due to the nature of our structured product activity, we are typically axed to sell upside volatility. It means we have an interest to trade variance swaps, where not only the realised variance but also the notional of the trade will depend on the spot level during the life of the product," explains SG's Beattie.

Chicago-based hedge fund Citadel, with more than $13 billion in funds under management, has previously traded equity correlation swaps with SG, but its global head of volatility trading, Pavandeep Sethi, declined to comment on the latest variance products and related trading strategies.

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Alastair Beattie,
SG

Explaining how the instrument would vary from a typical variance swap, SG's Beattie says: "In a normal variance swap, you just look at all the spot price readings and calculate the realised variance. The payout is then based on this. In the case of the up-var swap, you only take the returns when the spot is above the initial level when you trade." This means that if the trade was initiated when the spot price was €100, returns would be taken whenever the spot price was in excess of €100. This makes the price of the up-var swap cheaper than a standard variance swap. "Depending on the steepness of the skew, the up-var swap can be up to four to six points cheaper than the standard variance swap," says Beattie.

An attractive smile

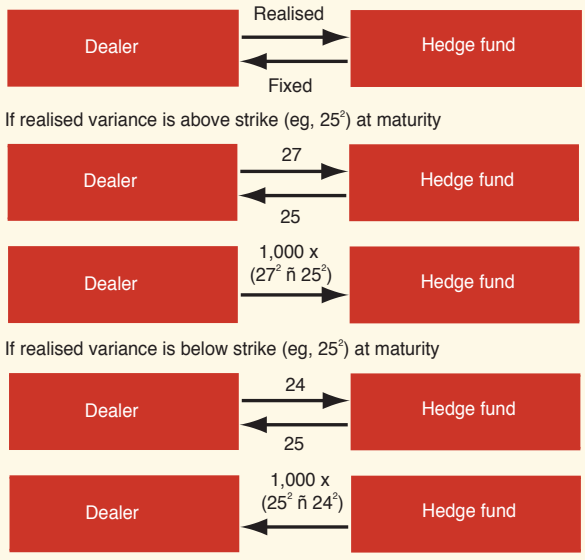
The reason such trades appeal to investors is due to the upside skew or smile being heavily discounted, notes Beattie. "This is driven by structured product houses being long the volatility on the upside, as well as significant covered call selling," he says. SG's structured products business is typically long volatility, and as spot prices go up, the product's notional increases and it ends up being longer and longer volatility. "If you back-test realised skew, you discover that the discount on the upside is not reflecting reality, so it is interesting to go long vol through an up-var swap, particularly with vol at its current low level," Beattie adds.

Hedge funds and proprietary trading desks can use these transactions as a statistical play and buy a basket of names or select a particular stock that they believe will rise in price and exhibit high volatility. "If that is the case, you are much better off doing an up-var swap rather than a standard variance swap, as you do not need to pay the premium for downside puts," says Beattie.

Nonetheless, not everyone is familiar with the product. "I haven't seen those in the market yet," says Maple

What is a variance swap?

Take two counterparties entering a variance swap contract. Party A is the dealer and seller of the variance swap; Party B is a hedge fund and the buyer of the variance swap.
The contract can be stipulated as follows:
Underlying index: Eurostoxx 50
Frequency of observation: daily closing prices of the Eurostoxx 50
Volatility strike: 25 (indicative, payout is linked to variance strike)
Variance strike: $25^2 = 625$
Currency: euro. Maturity: one year
Approximate vega notional: 50,000 (meaning the participants are willing to pay or receive approximately 50,000 per point of realised volatility above or below the volatility strike).
Variance units: 1,000 (ie, approximate vega notional/[volatility strike × 2])
Buyer payment at maturity: variance units × max [0, variance strike – realised volatility^2]. Seller payment at maturity: variance units × max [0, realised volatility^2 – variance strike]



Source: BNP Paribas

Leaf Capital's Wexler. "It sounds like you could form an interesting view on a stock and its volatility and associated direction. So there is some interest for the few of us in the market that use options for vol speculation and variance swaps in the first place, especially on single names, as there are very few that use it other than in dispersion. But it all depends on the price."

BNP Paribas and Deutsche Bank, meanwhile, have pushed gamma swaps to their clients, although neither had done a deal by the end of September. These 'third moment' swaps are effectively forward contracts with a payoff based on the difference between the realised and implied variance of returns of a particular asset. They involve both volatility and direction. They are like variance swaps, but daily returns are weighted according to the prevailing price levels of the underlying asset.

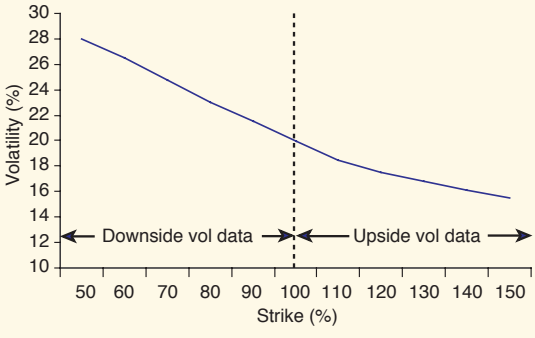
"It is a variance swap where the variance exposure depends on the spot level in a linear fashion," says Deutsche Bank's Carson. "So, if the market halves you have half of the vol exposure. If the market doubles, you have twice the amount. Whereas a variance swap has constant exposure to volatility and cash gamma as well."

This helps dealers manage their long volatility positions linked to their structured product activities. So if a market drops, their vega position is halved. But in this event, the volatility component is constant with a variance swap. Using gamma swaps, dealers are able to capture some of the vega exposure against spot price movement risks that they hold on their books.

Dealers also argue that as competition for relative value has grown in the variance swaps market, the use of gamma swaps may provide investors with a more precise instrument to extract value. Jean-Michel Ritoux, an equity derivatives structurer at BNP Paribas in Paris, believes gamma swaps will become the most efficient way for investors to conduct dispersion and correlation trades in the future.

"When you want to replicate the variances of the basket using the components when you set up the variance dispersion trade, you actually fix the weights of each component at the inception of the trade," says Ritoux. "But these weights do not vary throughout the trade. So you actually do an arbitrage between the variance of an index, which will effectively have different weights during its life compared with the one you have built up at the inception of the trade. If you use a gamma swap instead, at any given point in time, the weights change and replicate the correct weighing of the individual share in the index at the time. So it is much more precise." Ritoux says another potential area of interest for clients is the correlation picked up from such trades.

DJ Eurostoxx 50 five-year volatility skew as of October 25, 2005



Source: BNP Paribas

"The gamma swap is fully replicable. Like the variance swap, if you want to arbitrage them you can build them with vanilla products. There is no model risk in the pricing"

Jean-Michel Ritoux, BNP Paribas

Skew trades

SG, meanwhile, has pitched a trade based on a skew that it internally calls a 'smile' transaction. Beattie declined to talk about the product, but BNP Paribas' Ritoux says the smile is an interesting side effect of gamma swaps. "You can use them [gamma swaps] in conjunction with variance swaps to set up smile positions," says Ritoux. "If you put on a long variance swap and short a gamma swap, effectively you will build a positive vega position if the stock goes down, and a negative vega position as the stock goes up. So if you set up the position, long var swap and short gamma swap, hedged, you end up with a linear combination of risk reversal. So, the difference between the two products and the hedge is just like being long 110 calls and short 90 puts, long 115 calls and short 85 puts, and so forth all the way through."

The smile reflects the exposure of a portfolio of options with respect to changes in volatility relative to the spot level. Typical smile structures are set up using collars. The gamma swap minus the variance swap allied to a daily adjusted spot exposure is equivalent to a daily hedged continuous linear combination of collars.

Deutsche's Carson agrees that trading a gamma swap against a variance swap provides "downside skew versus upside skew, which is a very exciting profile". But trading in gamma and skew products has proven disappointing. "Volumes have not been as large as we were hoping for," says Carson.

A senior equity derivatives analyst at a large European bank says this might be partly due to the lack of homogeneity between the different products being pushed by dealers and limited transparency on pricing. "It is all about skew," he says, speaking on condition of anonymity. "It is a trade-off between the market risk of being short a lot of skew versus the pricing risk of selling or buying a product at a level at which you are not quite comfortable. You know it is a blanket hedge of some sort, but getting an accurate price or pricing level is a compromise just to get some of that risk off," he adds. "If you go and get price levels from any of the banks offering these products the bid/ask spread would be about a mile wide."

But Ritoux says there is no issue related to pricing transparency. "The gamma swap is fully replicable. Like variance swaps, if you want to arbitrage them you can build them with vanilla products. There is no model risk in the pricing." ○