

Although the first carbon option was traded three years ago, options trading had been slow to take off. It was not until mid-2007 that EU allowance (EUA) option activity began to take traction and pick up in terms of its overall traded volume.

On the strength of solid historical price data, a measure of regulatory certainty, the introduction of a secondary market for certified emissions reductions (CERs), and the entrance of new players into the market, the trading of options has become a central element to the global carbon market. Participants are using options to hedge, access liquidity and employ the efficient use of capital. Considering today's volatile financial markets, there is all the more reason for carbon derivatives to take off.

The emergent nature of the carbon dioxide (CO₂) market has invariably meant that it lacked the required historical underlying price data – the back history that is so crucial to pricing options. Certainly it did not help to encourage early participation. Additionally, various supply, geopolitical and structural issues can and have profoundly affected the underlying market, in rather unpredictable ways.

All of these factors add to the mix of issues that needed to be considered when trying to determine a fair implied volatility, the core underlying variable in options trading (see 'What is volatility?', page 28).

Nonetheless, there was an inherent need to employ derivatives to manage risk in EUA and CER markets. The EUA market, in particular, proved to be quite volatile – susceptible to massive swings predicated on regulatory issues.

Inevitably, the first EUA option transaction was executed in the over-the-counter market. The inaugural carbon option trade on 19 September, 2005 was a significant milestone, when you consider the embryonic stage of the market at the given time – the EU emissions trading scheme (ETS) had only officially started on 1 January that year.

Volume activity two years on from the first option trade was sporadic. But today we are up and running. According to the European Climate Exchange (ECX) – which provides data on year-on-year options volumes – trading of cleared CO₂ options has exploded in growth. Year-on-year options volume

for July this year equated to 878,000 tonnes of CO₂, compared with 308,000 tonnes in the same month last year – an increase of more than 184 per cent. By comparison, the year-over-year futures volume for July increased by 88.75 per cent.

There have been a number of advancements and structural changes to the CO₂ market that have contributed to this increase, including the range of instruments that are now available to market participants and the more diverse strategies now employed by these participants.

Firstly, there has been a notable shift away from the one-way constrained bet type trades that investors were taking back in phase one of the EU ETS (2005–2007). Traders are now taking on more sophisticated arbitrageur roles.

For example, the now vibrant secondary CER market – carbon credits that have been generated by a clean development mechanism project in a developing country and sold and then sold again – did not exist back in 2005. This market is now well established and participants can trade the disparity in price between CERs and EUAs via the so-called swap. When the two markets diverge to trade beyond certain parameters, which is inconsistent with what the user perceives as value, these arbitrageurs move to exploit that differential and, in doing so, provide two-way counter flow in the respective instruments thus increasing liquidity. Ultimately, these types of more complex trade initiations and the resulting liquidity increases have helped to reduce the overall level of volatility and help to facilitate a more robust two-way driven market. This also has the knock-on effect of inducing liquidity, because users are instigating larger positions in the confidence that they can now get in and out of the market relatively easy.

Another example of an arbitrage-style trade approach, which has had a direct effect on volatility, is related to option traders who employ the volatility-based market-maker type strategy (volatility book). Using the combination of call and put options in conjunction with futures they effectively trade options similar to a bookmaker, where they seek to return small, but regular profit. Their need to dynamically delta hedge their option positions to maintain overall delta neutrality creates further liquidity in the underlying contract

BRETT GENUS AND **AIDAN FREEBAIRN** TAKE A LOOK AT THE GROWING ROLE FOR DERIVATIVES TRADING IN THE CARBON MARKET

A fair price to pay

A full-page background image of a person climbing a rock face. The climber is wearing a blue t-shirt, yellow pants, and a red helmet. They are secured by a rope and climbing gear. The rock face is a warm, reddish-brown color with visible cracks and textures.

and arguably can provide resistance to the flow of the market (see glossary box, page 30).

As volumes increase, and as we are able to benefit from several years of historical trade data in the underlying carbon commodities, some important trends can be discerned. Looking back, the first option trade – between EDF Energy and Statkraft and which was brokered by Evolution Markets – provides insight into the underlying fundamentals that still drive the market today.

The trade, a €15/€32 strangle – options position involving purchase of call and put with different strike prices, but same expiration date – transacted at 50 per cent implied volatility (IV). Ever since, the market has transacted around a 50 per cent average by anything from +/-8 per cent. The primary driver resulting in the rather high 50 per cent IV mean was the belief that being a completely new market the price of the underlying EUA could potentially move by at least half of its entire value if not more. In addition, there was a basic risk for writing options in a new, but illiquid, market and for which arguably a premium was warranted.

On the other hand, the underlying EUA market had begun to exhibit all the early signs of becoming a rather efficient market. A review of the EUA 100-day actual historical volatility saw it at 49 per cent in mid-September 2005, right at the implied volatility of the first trade. Essentially, it was felt that this efficiency was likely to continue to be the case, which ultimately would result in less dramatic price changes and, as a result, lower volatility.

In retrospect, it probably was too premature an assumption and too conservative an estimate, given the situation that later occurred upon the release of the first year's verified emissions data on 25 April 2006.

On that day, the EU released emissions verification data of the first year of phase one, which led to the wide assumption that the initial phase of the programme was extensively long or oversupplied with EUAs. The emissions data released that day contributed to the most dramatic one-way driven EUA price move to date. The EUA price dropped to a low of €14 from €30,



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in the less than three days. Meanwhile, the historical 100-day volatility went from 49 per cent (25 April 2006) to 73.79 per cent (20 June, 2006).

It is evident by reviewing the 100-day historical volatility that the market has basically ranged between 25 per cent and 50 per cent ever since, and has not been seen above 50 per cent since October 2006. At the time of writing, the at-the-money implied volatility according to ECX settlement is currently at 47.25 per cent (26 September) while 100-day historical volatility is 32.30 per cent. On the face of it, it would seem that the disparity between these two values is illogical. However, it is important to differentiate between the two values. Historical volatility being a measure of prior price fluctuations over a set period of time and implied volatility being a measure of a market's perceived future risk of price fluctuations. With the short history of the EUA market and the collapse of prices in phase one, it becomes slightly more apparent that a high implied volatility has some credence.

From the fundamental perspective, the European commission has made appropriate modifications, steps which should ensure that the second phase (2008–2012) of the EU ETS is not a repeat of the embarrassing first. These steps should subsequently mean that there will not be such a discrepancy between the amount of allowances issued and the fundamental demand for said allowances or at least not to such significant degree. Aside from this, countries are also planning to increase the volume of allowances to be auctioned post-phase two, while some EU member states are taking it upon themselves to cut caps more aggressively than those that have already been approved by the commission.

The fact that there are these fundamental differences between the EUA futures contract now and the one back in 2005 would certainly imply that volatility should reflect this. At the time of agreeing the 50 per cent volatility on the inaugural EUA options trade, it had been presumed that the

ETS might potentially be linked with other schemes. Such links might have resulted in the whole supply/demand curve seeing a significant swing, invariably resulting in a drastic one-way driven swing for the price for an EUA. Although this risk has since been discounted by participants, the level of implied volatility appears to remain tied to the 50 per cent peg even in the face of a significantly lower historical volatility. This would imply that the options market as a whole is still pricing in some major potential risks, whether it will continue at that level is anyone's guess.

CER options

On the face of it, the CER options volatility curve and term structure would appear to be rather similar to that for EUAs. This is mainly due to the CER price trading as a function of the price of EUAs, up until ECX and The Green Exchange launched CER futures in March 2008.

Until recently CERs were trading a rather noticeable direct correlation with the price of EUAs. However, as swaps become more actively traded, CERs have seen increased two-way flow. Effectively it has culminated in participants playing the differential between the two instruments. Therefore, CERs have begun to take on market characteristics and fundamental drivers of their own. For instance, the run up to the October CITL and ITL linkup – EU ETS software with UN software – has recently had profound effects on both the EUA/CER swap price and the CER curve.

Initially, market participants were disseminating CER price risks, in part, using EUA options. As these trades typically took place bilaterally, they lacked transparency and it is impossible to be precise on specific details. However, this type of options activity frequently coincided with CER trading activity often occurring concurrently with the approval of a large CER primary project.

What is volatility?

Essentially it is an input element that determines the level of option prices. Volatility is a measure of the rate and magnitude of the change of prices (up or down) of the underlying instrument. If volatility is high, the premium level of the option will be relatively high, and vice versa. Once you have a measure of statistical volatility for the underlying, in theory you can plug the value into a standard options pricing model and calculate the theoretical fair value of an option.

Furthermore, if successfully determining the premium level for an option that has been transacted in the marketplace, coupled with establishing the corresponding level of the underlying instrument, at the point of trade, you can then extract the implied volatility (IV) for that option. You can then compare where the option has traded in relation to its theoretical value (Theo) or what can be best considered as its fair price. However, IV should ultimately always be considered a guide to price valuation if not a price itself and, as such, is inherently a subjective value and therefore will always depend on one's own perception.

These EUA options plays would make little sense in-terms of either directional outright constrained bets or volatility-instigated plays, and so it would appear that they were CER related. Most recently, there has been a notable increase in the number of market participants seeking to trade CER options as would be consistent with a more robust underlying market. These have been mainly hedge-related – for example, by those who are known to have open long CER portfolios (holding carbon credits still to be sold).

Going forward, the CER market fundamentals support increased options activity. Put simply, there is a lack of clarification on the CDM post 2012. Furthermore, CER supply could be impacted by policy changes by the CDM executive board – the UN-appointed body that oversees the mechanism – such as rules about ‘additionality’ (whether or not a project would have gone ahead without the carbon finance element) that could result in firmer CER prices in the short term. Inversely, rules pertaining to admissibility may see the CER prices depressed as we approach the end of the second phase of the EU ETS, which would be the most noticeable in the back end of the CER curve. Traders recognise these kinds of risks and CER options have aided hedging strategies.

The emergence of the CER market provides some insight into how options will increasingly be employed in the carbon market. The primary strategy behind carbon derivatives will likely continue to be the preemptive hedging of perceived risk. This makes perfect sense when you consider that potentially trading in the carbon market, while not employing options to offset ones risk against adverse and dramatic price movements, could be considered tantamount to driving without insurance.

An example of how options have historically been used as an insurance tool would be the simple purchase of a put

option. Puts effectively accrue value as the underlying asset loses value, thus insuring against unexpected adverse price movement. Often the price of purchasing an ‘out-the-money’ put – a put whose strike price is far below the underlying price at the time of initiation – and therefore guards against a ‘worst-case scenario’, is relatively cheap and can be considered as a one-off payment akin to an insurance premium. This strategy has been a relatively popular one and has been utilised by institutions including CDM project participants and banks with exposure to downside risks for CER/EUA prices.

Of course, the precise timing of market turns and liquidity of the underlying EUA and CER markets are both unknowns. The important question is what a carbon trader can do to guard against these types of circumstances and occurrences. At the very least, market participants will look to limit lost opportunity and brace for any potential loss that they may incur as a consequence. Derivative instruments can provide and have been acknowledged as offering constant liquidity streams even in distressed market conditions. The trader’s ability to guard against unforeseen extreme moves in EUA or CER price valuations, have become of more concern and are certainly an important issue, hence highlighting the need for options usage particularly in an insurance sense.

In today’s shaky financial markets, the transfer of risk becomes an ever more important element to effective carbon trading, ensuring that the derivatives, and particularly the options markets, are all the more important with the unfolding credit crunch, the extent of which is still yet unknown and the increased likelihood of a global recession looming the careful choice of strategic investment is paramount. Establishing which assets offer attractive risk reward, liquidity and limited counterparty risk, step to the forefront when investing and become a priority. It has been acknowledged that derivatives go some way towards, and are possibly crucial to, reducing some of these risks. This is the case when talking about exchange-cleared derivatives, which remove the element of counterparty risk and which is very much in mind with the current economic situation and diminished confidence with relation to credit risk.

The reality is that derivatives have been, and will continue to be, embraced by participants globally. In addition, the maturation of the carbon market combined with a period of unprecedented upheaval in global financial markets is likely to stimulate interest in new derivative products and new risk management strategies. Fundamentally adapting to the uncertainty in today’s markets could ultimately mean the difference between staying in business or not. Exploring the alternative investment strategy might just mean avoiding insolvency for the trader or investor. ●

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Derivatives glossary

- **Call option:** The buyer of a call option has the right, but not the obligation to buy an agreed amount of an underlying commodity or security at an agreed price (strike) on a set date (expiry)* from the seller of the option. The buyer pays the seller a premium for this right.
- **Delta:** measure of the change in price of an option relative to movements in the price of the underlying instrument.
- **Delta hedge:** This is a method of hedging risk associated with having an open options position which involves buying or selling the underlying instrument in an amount in proportion to the delta of the option.
- **Put option:** The buyer of a put option has the right, but not the obligation to sell an agreed amount of an underlying commodity or security at an agreed price (strike) on a set date (expiry)* to the seller of the option. The buyer pays the seller a premium for this right.

*These definitions relate to European style options which all listed EUA and CER options are at the current time.