Six themes that characterize trading in the energy markets today

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When numbers matter

A little over one year ago, Numerix sponsored a webinar that addressed XVAs and counterparty credit risk within the energy markets.[1] In November of 2022, we decided to sponsor a second webinar that brought back some of the same panelists to further their discussion regarding trends and challenges in the energy markets—but this time taking a "one year later" perspective.

In this paper, Numerix provides a look at six of the core themes that formed during that discussion.

1 Model calibration and hedging for XVA teams have been challenging due to the turmoil in the energy markets over the last year.

It is well understood that XVA calculations require stochastic models for the underlying risk factors under consideration and these models require calibration to market data, ideally to volatility surfaces. In energy markets, particularly when dealing with less liquid underlyings such as gas bases or regional power prices, it is common to find that the required volatility surfaces are unavailable or very sparse. The markets for nonlinears over these underlyings are simply not as developed as they are for the major indices or benchmarks.

In lieu of volatility surfaces, models are often fit to historical data, but this approach can lack responsiveness to recent upticks in volatility, as has been witnessed throughout 2022. This, of course, feeds into XVA scenarios and the resultant XVA figures, as well as associated risk figures such as PFE. In short, when we look at the market and observe clearly that there are elevated levels of volatility, we want that reflected in our scenarios and XVA figures, and fitting models to long periods of historical data can impede this.

The panel discussed some strategies to overcome these difficulties. One such strategy was to identify which model parameters required stability and consistency within the entire historical sample period and those which could safely vary over the sample period (i.e., those which behaved more like processes themselves). Volatility is an obvious example of the latter (a process), while the parameters governing reversion and seasonality were examples of the former. Volatility could be allowed to vary according to, say, an EWMA (exponentially-weighted moving average) process during calibration, and the current volatility could be extracted from the recent history and projected forward over the risk horizon under consideration. Naturally, a dedicated stochastic volatility model would avoid these problems altogether, but it was the view of the panel that such models are not widely used in the XVA setting within energy markets.

Hedging requirements have also been impacted by the recent instability in markets as participants seek to rebalance their hedges more frequently. Speed of XVA calculations is the critical factor here and the group discussed a number of techniques and technologies that are being employed. Some market participants are making use of high performance compute GPU technology and joint algorithmic differentiation to achieve a level of performance where you are enabled to calculate all the sensitivities you need—rapidly and accurately. It is clear that over the last 12 months, the knock on effect of energy market volatility has been to put more pressure on models to reliably deliver accurate results.

[1] To watch the webinar held on December 2021, click here. You can also access our whitepaper on the same topic, *The XVA Challenges Energy Traders Face in a Complicated and Volatile Market*.

2 Today, multiple sets of data are observed and modeling is becoming more sophisticated.

From a modeling perspective, energy market participants today look at many different types of data. Previously, traders would look at perhaps two or three different data sets and create and run their data models through excel. What we are now seeing is people looking at multiple different sets of real time data and their correlations to different parts of the energy markets. For example, if you are trading LNG (liquified natural gas), then you are not just looking at gas prices and gas data, but also power data and shipping transportation data. You're looking at whether there will be logistical bottlenecks, whether power plants will switch to gas and any other interconnected data. Before, we rarely saw traders look at all these different sets of data.

There is then the challenge, after acquiring all this data, of putting it into a centralized location and running sophisticated modeling off of it. So now we are seeing different modeling requirements and much more sophisticated analytical models being built. We are seeing AI models being built, we are seeing the use of machine learning. As a result, traders are now becoming sophisticated technologists who are running their own models, gathering their own data. So there is a lot of "do it yourself," which previously was probably outsourced to IT. The market is beginning to understand that leveraging the right data, in real time, and using sophisticated modeling will give you a leg up.

3 The use of machine learning applications is growing.

In the energy markets, an application of machine learning incorporated in the context of XVA is using deep learning and deep neural networks to replace traditional functions for pricing or valuations. There are a couple of drivers for this, but the key among them is that if you train a deep neural network model and run it on GPU, you can get tens of thousands of valuations simultaneously instead of just getting a single valuation. Deep learning also allows you to easily conduct AAD (algorithmic adjoint differentiation) because the algorithm that you use to train the deep neural network model is called backpropagation, which is precisely the same as AAD. You can train a model for any type of commodity or asset class—the same principle applies. It is something that works very well and it is available now.

4 There is no real use of MVA (margin valuation adjustment) and HVA (hedging valuation adjustment) in the energy markets.

MVA has not been widely adopted in the energy markets. In fact, MVA has not reached a mature state across all types of markets in all regions of the globe. From a practical perspective, energy market participants are aware of MVA, especially because initial margins have skyrocketed, and there is rationale for its adoption to grow. It can be a vastly useful tool and one would hope that it evolves over time. But it may never reach the usage status of CVA (credit valuation adjustment) and FVA (funding valuation adjustment).

Regarding HVA, which represents transaction costs as a valuation adjustment, it is something that is new and appears to not have any adoption in the energy markets. As always, it takes some time for new ideas to permeate, as it certainly did with FVA, for example.

HVA, however, is a sound valuation adjustment from a theoretical point of view. To a degree, banks always charge some element for transaction costs. HVA can be a way to codify it. As to whether it will ever be adopted by the market, it will be difficult to tell. We know about CVA and FVA adoption because they're part of accounting and reported in a bank's account statements. Conversely, the other XVAs are not explicitly mentioned in a bank's account statements.

To learn more on this topic from the expert panelists, view this on-demand conversation.

Andy McClelland, SVP of Quantitative Research, Numerix

Anthony Badali, Trader, Volatility Quant Strategies, RBC Capital Markets

Partha Jatterjee, Data and Analytics SME, Shell Energy Americas

Andrew Green, Managing Director and Lead GFI Quant, Scotiabank

Moderator: Karl Sees, Global Head of Product Strategy, CubeLogic

5 There is little to no usage of jump processes for XVA within the energy markets, though multifactor models are growing in popularity.

Jumps, generally, are not being used for XVA in the energy space, and that is considered true among most regions. Models with jumps are being used for pricing and hedging on a deal-by-deal basis, particularly for power products, but this has not permeated the XVA space in practice. Multifactor models are being used more heavily for XVA, however, as participants seek to capture realistic correlations across maturities along their curves. Interest rate markets are more developed in this regard, which owes in part to the fact that multifactor models were widely used before XVA and CCR modeling came to prominence for, as an example, CMS products. Such curve-dependent products have historically been less common in energy markets, or at least have not enjoyed the same levels of liquidity.

6 Over the last year, we've seen banks beginning to trade with small, lower-quality energy producing firms.

Banks are looking at the future profit potential of trading with newer, smaller energy firms, which do not have much history in the market. As a result, we are seeing risk adjusted rates of return measures being increasingly applied to these counterparties, which tend to be wind and solar producers, as well as battery manufacturers—industries that banks think could have a chance of growing over time. Nonetheless, during this market uncertainty there's going to be a premium involved. Commodities are volatile and thus exposures are volatile, and so if a bank wants to deal with the smaller names, it's probably going charge a decent spread.

Within the realm of smaller producers, the renewable theme is coming to the fore. There is an industry-wide push to be more ESG friendly. So, there may also be non-economic reasons why some banks would want to deal with these counterparties, because they represent a green tilt and want to help that part of the economy grow.

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