Pricing Problem

Mathematical models

Together with long term bilateral contracts, other - possibly additional - ways of managing various risks can be considered by a producer. Indeed he can also buy or sell financial instruments, such as derivatives. The simplest form of derivatives are the call and the put which may be specialized for the electricity commodity. They tipically give the right (but not the obligation) to sell or buy a certain amount of energy at a given price. The price of this option is the strike price. Other, more sophisticated, options do exist, for instance a combination of both usually named a c ollar or other such as swing options. In choosing this options, two fundamental problems arise:

1. from the selling side, the pricing, i.e. how much is the value of the instrument.
2. From the buying side, the portfolio optimization, i.e. given a set of proposed derivatives, decide which one to buy and if/when to exercise them.

Modeling and algorithmic considerations

The pricing problem can be solved in a closed form with the well-known Black and Sholes (B&S) approach that has been criticized by various authors. However in the context of the electricity market more advanced pricing models may be useful. A recent and interesting approach is based on robust optimization models. Indeed, as the classical B&S approach, the option pricing problem is to replicate an option with a portfolio of underlying (available) securities in each possible scenario, and therefore the robust valuation scheme proposed by some author is natural and conceptually sound. Therefore one can use manageable robust optimisation linear programming problems, based on a dynamic hedging strategy with a portfolio of electricity futures contracts and cash (risk-free asset). The model can be used to find a risk-free bid (buyer's) price of the swing option.

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