Derivative Pricing in Electricity Markets

In portfolio theory, the most commonly used model for estimating the value of an option is the Black and Scholes model [1]. This model is based upon the assumptions of modern portfolio theory, where prices reflect all the available information. The Black and Scholes model gives the value of an option as a function of the spot price and the volatility of the underlying asset, the strike price, the time and the risk free rate. It is suitable for European options, while the estimation of an American option will require in addition to estimate the likelihood of early exercise (generally resulting from discontinuity events such as dividend distribution or bankruptcy).

Option pricing in energy markets raises specific issues, due to difficult storage and the existence of spot price models [2,3]. For this reason, the time of exercise is a much more crucial parameter than in financial markets, and can be negotiated between the parties. Therefore, European and American options shall be treated separately. European options can be priced by predicting a spot price and using an approach similar to the Black and Scholes model. For American options, the Black and Scholes equation becomes an inequality which solution can be approximated by robust optimization models [4,5].

The ongoing transition from centralized architecture to interoperable grids managed by competing operators is expected to boost inter-grid transactions. The expected cost reduction in storage solution will offer to operators a more and more viable alternative to the sale of production surplus. These parameters must be taken into account in a model for derivative pricing.

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Contributor

Dr Philippe Ezran, Large Networks and Systems Group (LANEAS)

Dr. Yoram Haddad, Jerusalem College of Technology