

Electricity market: how to deal with spikes



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The recent deregulation of the energy market has given rise to a range of new and rather complex financial products. The price of electricity, for example, can show high and unpredictable spikes. How can you price electricity while nevertheless taking advantage of the opportunities the new markets have to offer, Dominique Dupont and Maria Khopolova want to know.

How to manage risks?

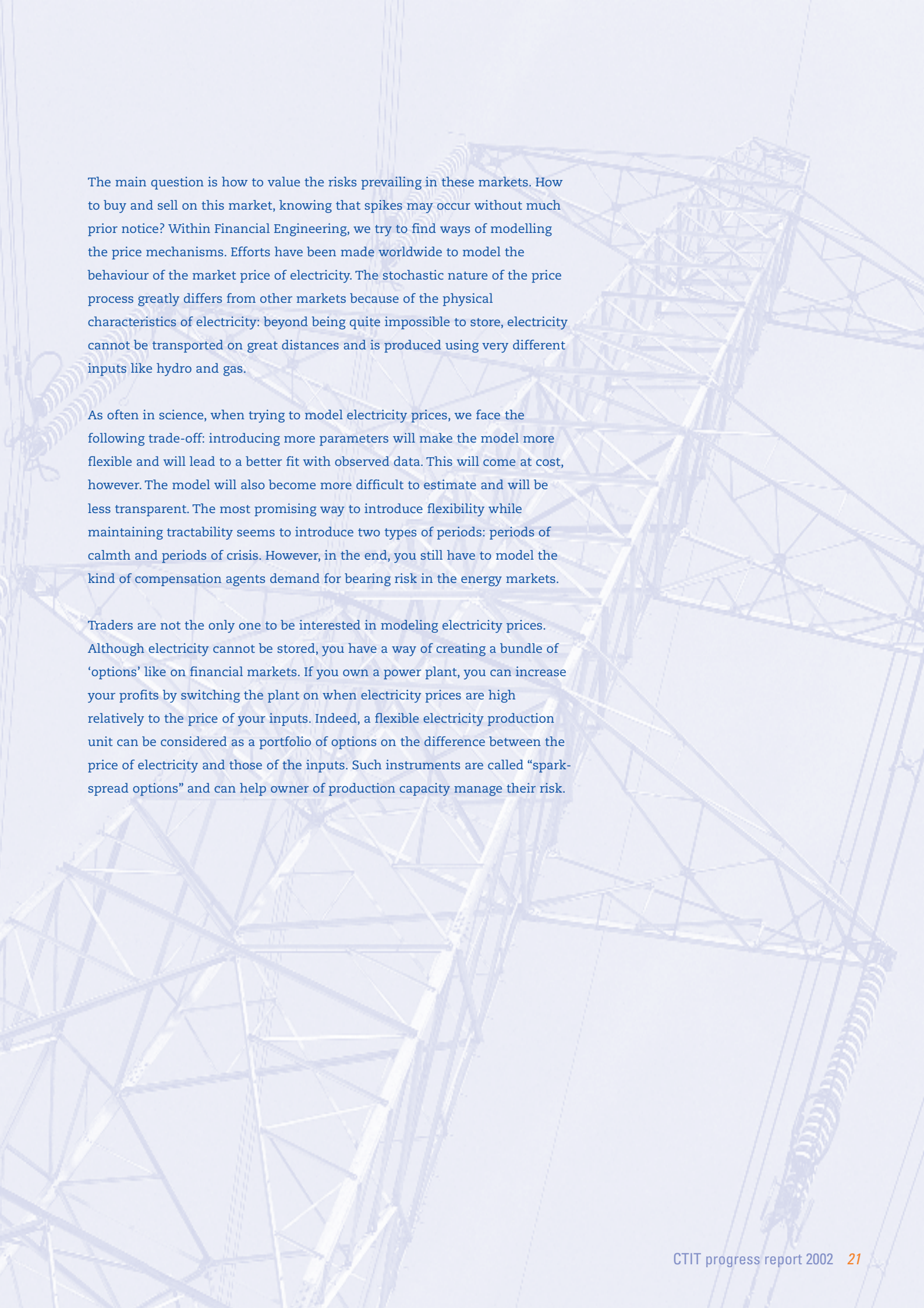
One of the major differences between the energy market and other commodity markets is that electricity cannot be stored easily. Apart from indirectly storing it in form of water in a water reservoir, there 's no way of creating a substantial stockpile of electricity. Consequently, and in contrast with conventional goods, one cannot use inventories to even out price fluctuations.

Electricity prices now freely vary to find an equilibrium in supply and demand, which makes them highly volatile. A sudden shortage caused by a power plant going offline can cause prices to skyrocket. It is these unpredictable 'spikes' that make the energy market so different from other commodity markets. Spikes only last for hours or days; prices drop to an average value afterwards. On an electronic trading platform like the Amsterdam Power Exchange (APX), electricity is priced on the hour: so a spike follows after the event has taken place. Detailed knowledge about maintenance schedules of the plants would help, but this information is not widely available. Apart from these sudden changes, there are of course more regular mechanisms, like day and night changes and seasonal effects.



Examples of current projects:

- Economic capital allocation and the impact of fair value accounting
- Measuring effects of dependence on insurance portfolios



The main question is how to value the risks prevailing in these markets. How to buy and sell on this market, knowing that spikes may occur without much prior notice? Within Financial Engineering, we try to find ways of modelling the price mechanisms. Efforts have been made worldwide to model the behaviour of the market price of electricity. The stochastic nature of the price process greatly differs from other markets because of the physical characteristics of electricity: beyond being quite impossible to store, electricity cannot be transported on great distances and is produced using very different inputs like hydro and gas.

As often in science, when trying to model electricity prices, we face the following trade-off: introducing more parameters will make the model more flexible and will lead to a better fit with observed data. This will come at cost, however. The model will also become more difficult to estimate and will be less transparent. The most promising way to introduce flexibility while maintaining tractability seems to introduce two types of periods: periods of calmth and periods of crisis. However, in the end, you still have to model the kind of compensation agents demand for bearing risk in the energy markets.

Traders are not the only one to be interested in modeling electricity prices. Although electricity cannot be stored, you have a way of creating a bundle of 'options' like on financial markets. If you own a power plant, you can increase your profits by switching the plant on when electricity prices are high relatively to the price of your inputs. Indeed, a flexible electricity production unit can be considered as a portfolio of options on the difference between the price of electricity and those of the inputs. Such instruments are called "spark-spread options" and can help owner of production capacity manage their risk.