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EDITOR'S LETTER

The six papers selected for this special issue of *The Journal of Energy Markets* are all related to energy risk management, including both risk assessment and risk hedging by financial derivatives. Most of them are directly applied to electricity prices and markets, and take into consideration both price risk and volume risk. They can be divided into two groups of three papers each.

The first group of three papers focuses mainly on risk assessment by probabilistic forecasting.

In this first group, the paper by Kevin Berk and Alfred Müller discusses probabilistic forecasting of electricity demand, ie, volume risk, breaking down aggregated demand data into business sectors. This type of analysis is uncommon in the existing literature. The authors propose an exponential autoregression "reference frame" model, valid for the distribution of demand in all of their sectors, that can be further specialized and backtested on individual sector data. Some scoring rules (continuous ranked probability score and rank histograms) are used to generate ranking tables that allow the authors to tailor the analysis of volume risk to individual classes of businesses. Special care is devoted to the modeling of distribution tails.

The paper by Florentina Paraschiv, Risto Hadzi-Mishev and Dogan Keles discusses probabilistic forecasting of electricity day-ahead hourly price series for price risk assessment. In this case, distribution tails and their dynamics pose challenges even more difficult than those posed in the case of demand. In the context of quantile modeling, the paper studies the difficulties of combining autoregressive-generalized autoregressive conditional heteroscedasticity (AR-GARCH) autoregressions with extreme value theory (EVT) and studies the effectiveness of the results. The authors test their models by comparing the historically obtained empirical quantiles with their model estimates. Theoretical attention is specifically addressed to the problem of properly delimiting spikes, ie, which data subset should be selected to be included in

the EVT.

The paper by Saša Žiković and Ivana Tomas Žiković discusses the probabilistic price forecasting of electricity-related commodities (oil, gas, coal and nuclear fuel), taking into account not only quantile (ie, value-at-risk (VaR)) modeling but also expected shortfall (ES) modeling. The authors estimate a large set of econometric models for VaR and ES on price data, backtest them using two consistency tests, and rank them according to a chosen loss function in order to discover whether the highest-ranked models have features in common and are valid for a range of commodities. Their main results are that GARCH-EVT and, more generally, semiparametric approaches are the best basis for modeling the prices of these commodities, and that VaR and ES behave similarly under these tests and rankings.

The second group of papers focuses mainly on price and/or volume risk hedging via the proper selection, or design, of financial derivatives.

In this second group, the paper by Georgios Charalampous and Reinhard Madlener discusses the variance-reducing performance of European Energy Exchange (EEX) futures contracts when they are used for dynamically offsetting opposite EEX spot positions, in an optimal dynamic hedging ratio, for price risk hedging. For a given commodity (electricity, gas or coal), a static hedging ratio can be simply obtained by linearly autoregressing spot prices on futures prices. The authors instead choose a more sophisticated multivariate GARCH model, which allows for a dynamic hedging ratio, in terms of GARCH covariances, to be associated with a given spot/futures time-series pair. By the use of an indicator called hedging effectiveness (an estimate of the variance reduction power of the chosen ratio), performances of futures of different horizons can be ranked in order to find, for each commodity separately, the optimal contract horizon. The authors include a discussion about using (static) modern portfolio theory to study, for a given commodity, the performance of the optimal inclusion of futures of all horizons in the same portfolio.

The paper by Laura Cucu, Rainer Döttling, Pascal Heider and Samuel Maina discusses combined price and volume risk hedging in gas markets. An econometric model for correlated gas spot price and demand in the form of a continuous-time process driven by a set of Wiener processes is set up, and an analytically tractable quanto contract is priced on them. In this case, volume is represented by temperature, and the quanto contract is written on both gas spot prices and a reference dynamic temperature index, in the form of a stream of cashflows. Because of the structure of the model, price and temperature legs can be independently calibrated to gas forward prices, historic temperature data and temperature futures (for the temperature market price of risk). Correlation is introduced by directly correlating the Wiener processes, and the model can be calibrated using historic data. A sensitivity analysis completes the discussion of the contract as a risk management instrument.

The paper by Rachid Id Brik and Andrea Roncoroni discusses a difficult problem that is very rarely addressed in the literature: that of designing an optimal derivative contract to be used to hedge combined price and volume risk in an energy commodity market, using portfolio theory, an equilibrium approach and martingale theory. The authors start from an unhedged position on stochastic price X and volume Y and look for two distinct payoff functions, one on X only and another on a stochastic index I (correlated with Y) only. If a portfolio that linearly combines the bare position with the weighted sum of the two payoffs minimizes a generic expected utility, and if the payoffs are valued under a market martingale measure, then a functional optimization problem is set up to implicitly define the two payoff functions. Assuming a mean-variance utility function, a lognormal market and (critically) that X is independent of I (but not necessarily uncorrelated with Y), an analytic explicit solution for the two payoff profiles is obtained. The authors test this solution on market data for a naked position on electricity and temperature, and extract the two payoffs that minimize the variance of the hedged position. They carefully discuss the implications of their independence assumption and showby perturbation theory that the unperturbed model payoffs remain optimal at reasonably small couplings, and that the hedge can be profitably used in real markets.

The papers in this issue of *The Journal of Energy Markets* were specially selected from more than forty papers that were presented at the Energy Finance 2014 (EF14) conference in Erice, Italy. They benefited from discussions at that meeting as well as review from anonymous referees. The work of these referees is gratefully acknowledged.

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PAPERS IN THIS ISSUE

Probabilistic forecasting of medium-term electricity demand: a comparison of time series models

Kevin Berk, et al | Volume 9, Number 2 (June 2016)

This paper focuses on medium-term probabilistic forecasting for risk management purposes.

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Extreme value theory for heavy tails in electricity prices

Dogan Keles, et al | Volume 9, Number 2 (June 2016)

This paper looks at hourly spot prices at the German electricity market and applies extreme value theory (EVT) to investigate the tails of the price change distribution.

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Two sides of the same coin: risk measures in the energy markets

Saša Žiković, et al | Volume 9, Number 2 (June 2016)

This paper investigates whether there are existing common model features that yield consistently superior results under both VaR and ES risk metrics in the energy commodities markets.

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Risk management and portfolio optimization for gas- and coal-fired power plants in Germany: a multivariate GARCH approach

Reinhard Madlener, et al | Volume 9, Number 2 (June 2016)

This paper investigates the hedging effectiveness of energy derivatives traded at the EEX for the purpose of mitigating the risk exposure of gas- and coal-fired power plants in Germany.

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Managing temperature-driven volume risks

Laura Cucu, et al | Volume 9, Number 2 (June 2016)

This paper proposes a stochastic model for coupled natural gas spot prices and temperature.

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Static mitigation of volumetric risk

Rachid Id Brik, et al | Volume 9, Number 2 (June 2016)

This paper formulates a functional optimization problem over a set of regular payoff functions to deal with the joint mitigation of combined price–volume risk using purely financial tools.

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