



CMA

Centre of  
Mathematics for  
Applications

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CMA INDUSTRY DAY

*Modeling and analysis of risk in electricity markets  
- recent techniques for price modeling and valuation*



UNIVERSITY  
OF OSLO

■ BIRKELAND INNOVASJON  
Technology Transfer Office at the University of Oslo

*ff* Norwegian  
Centre of  
Excellence

■ The Research Council of Norway

Trading electricity is a volatile business. By participating at this year's CMA Industry Day, you will be guided through the highlights of recent research on risk modeling and analysis of electricity markets, with a particular view towards the Nordpool market.

The focus will be on specifying stochastic models for the spot and forward/futures price dynamics, how to estimate these and techniques for pricing and hedging electricity options. Through the day, the participants will learn advanced analytical and numerical techniques for stochastic modeling of price evolutions in the electricity market, including the Heath-Jarrow-Morton (HJM) approach, Monte Carlo simulations, risk measuring, currency risk, and copulas in multivariate modeling.

## COORDINATES

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- **Lecturer: Professor Fred Espen Benth**
- **Organizer: Birkeland Innovation AS**
- **Time: November 8, 2004, 9-15**
- **Place: CMA, University of Oslo**  
(precise description will be distributed prior to the event)
- **Participation fee: NOK 4000. Includes access to 5 lecture hours, course documentation and lunch.**

## ENROLMENT

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Please register for the CMA Industry Day within October 25th, by;

- **Web [www.cma.uio.no/industryday](http://www.cma.uio.no/industryday)**
- **e-mail [cma-info@cma.uio.no](mailto:cma-info@cma.uio.no)**
- **or phone +47 975 42 688**

## PROGRAM

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### MODELING OF THE SPOT PRICE DYNAMICS

- ▶ Seasonal variation and mean-reversion
- ▶ Modeling of spikes
- ▶ Multi factor and regime models
- ▶ Multivariate modeling and copulas
- ▶ Estimation and simulation

### PRICING OF FORWARD/FUTURES

- ▶ From € to NOK: exchange rates
- ▶ Deriving forward/futures prices from spot
- ▶ Market price of risk
- ▶ Modeling forward/futures directly
  - Heath-Jarrow-Morton approach
  - Smoothing of the forward curve
  - Volatility modeling
  - No-arbitrage conditions
  - Parameter estimation

### OPTIONS ON FORWARD/FUTURES

- ▶ Pricing using a spot model
- ▶ Estimation of implicit volatility
- ▶ Pricing under a Heath-Jarrow-Morton model
- ▶ The Greeks: sensitivity and hedging
- ▶ Pricing using Monte Carlo methods



*Fred Espen Benth is a professor in financial mathematics at the University of Oslo. He has numerous publications in scientific journals and is used as a consultant by the energy and finance industry in Norway. Before becoming a professor, Fred worked three years as a consultant for the oil industry and researcher at the universities in Mannheim, Aarhus, Oslo and Trondheim.*

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