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Putting a price tag on temperature

A model for the evolution of daily average temperatures (DATs) is put forward to support the analysis of weather derivatives. The goal is to capture simultaneously the stochasticity, mean-reversion, and seasonality patterns of the DATs process. An Ornstein-Uhlenbeck (OU) process modulated by a hidden Markov model (HMM) is proposed to model both the mean-reversion and stochasticity of a deseasonalised component. The seasonality part is modelled by a combination of linear and sinusoidal functions. Modified and more efficient OU-HMM filtering algorithms relative to the current ones in the literature are presented for the evolution of adaptive and switching model parameter estimates. Numerical implementation of the estimation technique using a data set compiled by the National Climatic Data Center was conducted. A sensitivity analysis of the option prices with respect to the model parameters is included. This is joint work with PhD student H Xiong.