

Svetlana Borovkova (Amsterdam, The Netherlands) — **Stochastic time change for asset price modelling.**

In this talk, I will introduce the powerful technique of stochastic time change and show how it can be used for modelling asset prices, in particular, commodity and energy prices.

Prices of many commodities, such as electricity and natural gas, exhibit complex seasonal patterns, stochastic volatility and jumps. To model these features, I use the stochastic time change with seasonal (but also stochastic) demand proxy as an activity rate. This demand proxy is calibrated to the local temperature fluctuations. I derive many useful properties of the resulting price process such as stationary distribution and its moments, characteristic function and others, and develop a multi-step model calibration procedure. The model is then calibrated to the historical power prices and applied to generating realistic price paths by Monte Carlo simulations. I show that the simulated price process matches the distributional characteristics of the observed electricity prices remarkably well, in periods of both high and low demand.

To model intraday prices, whose volatility and volume fluctuate stochastically throughout a trading day, stochastic time change is again an excellent tool. I will demonstrate it on the example of oil and gas futures market. For these markets, I again use stochastic time change, but with another proxy for the activity rate: the global volume of news about the underlying asset. When futures returns are measured in such stochastic time, their distribution changes dramatically as compared to the observed returns distribution: it becomes much more "normal": light-tailed and symmetric. This shows that the high kurtosis observed in intraday returns can be explained, for a large part, by non-homogeneous trading activity observed throughout a trading day.

REFERENCES

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