Free Boundary SPDE models for the limit order book

Martin Keller-Ressel

TU Berlin

(Dated: October 31, 2013)

We introduce a framework for models of the limit order book based on a system of two stochastic partial differential equations (SPDEs) coupled by non-linear interaction at a free boundary. The two SPDEs model the evolution of the order book profile on the bid and ask side respectively, while the boundary interaction represents the (in general non-linear) effect of bid-ask-imbalance on price changes. Our model can be considered an extension of the order book model based on the stochastic Stefan problem introduced by Kim, Sowers and Zheng. Despite of the non-Lipschitz drift resulting from the boundary interaction we show existence of a solution up to a stopping time of the general model; extending results of Kim, Sowers and Zheng. Finally we analyze a stationary version of the model and show that the average order book profile of a model proposed by Bouchaud, Mezard and Potters can be recovered as a special case. This talk is based on joint work with Marvin Mller.