Optimal execution strategies in limit order books

(with Aurélien Alfonsi and Alexander Schied)

Following Obizhaeva and Wang (2005), we consider optimal execution strategies for block market orders placed in a limit order book (LOB). Our main contribution is to allow for a general shape of the LOB defined via a given density function and thus to include the case of nonlinear price impact of market orders. In this setting, there are now two possibilities of modeling the resilience of the LOB after a large market order: the exponential recovery of the number of limit orders, i.e., of the volume of the LOB, or the exponential recovery of the bid-ask spread. We consider both situations and, in each case, derive explicit optimal execution strategies in discrete time. Applying our results to a block-shaped LOB, we obtain a new closed-form representation for the optimal strategy, which explicitly solves the recursive scheme given in Obizhaeva and Wang (2005). We also provide some evidence for the robustness of optimal strategies with respect to the choice of the shape function and the resilience-type.