

# REDUCED FORM MODELS OF LIMIT ORDER MARKETS

TEEMU PENNANEN (AALTO UNIVERSITY)

## ABSTRACT

This paper proposes a simple parametric approach for stochastic modeling of limit order markets. The models are obtained by augmenting classical perfectly liquid market models by few additional risk factors that describe liquidity properties of the order book. The resulting models are easy to calibrate and to analyze using standard techniques for multivariate stochastic processes. Despite their simplicity, the models are able to capture several properties that have been found in microstructural analysis of limit order markets. Calibration of a continuous-time three-factor model to Copenhagen Stock Exchange data exhibits e.g. mean reversion in liquidity as well as the so called crowding out effect which influences subsequent mid-price moves. Our dynamic models are well suited also for analyzing market resiliency after liquidity shocks.