

## Limit Order Market Modeling with Double Auction

Mitsuru KIKKAWA

### Abstract

This paper formulates the limit order market model with double auction and describes its empirical properties. It focuses on trader-bounded rational behavior, theoretically and empirically. Using Nikkei 225 futures market data, this paper shows that

1. The trading volume is proportional to the difference in reservation price between sellers and buyers, theoretically and empirically.
2. The volatility distribution in the model is consistent with classical market microstructure results.
3. In some cases, traders did not choose their strategy rationally.
4. The execution price and the Walras equilibrium price are cointegration relationships. The latter has a price discovery role, compared to the former. If new information is first aggregated in the Walras equilibrium, then, ceteris paribus, the Walras equilibrium dynamics drives the basic dynamics.

Keywords : Double Auction, Bounded Rationality, Multinomial Logit Model, Price Discovery

### Reference

- [1] Chatterjee, K. and Samuelson, W. (1983). Bargaining under Incomplete Information. *Operations Research*, 31, 835-851
- [2] Hasbrouck, J. (1995). One Security, Many Markets: Determining the Contributions to Price Discovery. *The Journal of Finance*, 50, 1175-1199
- [3] Kikkawa, M. (2009). Statistical Mechanics of Games - Evolutionary Game Theory -. *Progress of Theoretical Physics Supplement*, 179, 216-226
- [4] Nash, J.F. (2001). Non-Cooperative Games, Facsimile of Ph.D. Thesis. In H. W. Kuhn and S. Nasar (Eds.), *The Essential John Nash*, (pp.53-84). New Jersey: Princeton University Press.