

A Dynamic Model of Online Auction Market: Theory, Identification and Estimation

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Abstract

I develop a method for identifying and estimating a dynamic model of auctions like eBay. The market is modeled as an infinite sequence of second-price, sealed bid auctions of a homogenous good. Bidders have unit demands. They arrive randomly and, upon arrival, they enter a pool of potential bidders. The actual bidders in an auction are drawn randomly from the pool. Conditional on bidding, a bidder exits if she wins and returns to the pool if she loses. Bidders in the pool exit with some probability each period but, if they do not exit, they can bid again. Thus, bidders need to take into account the option value of losing and bidding again when they submit their bids. This is the source of the dynamics. I define and solve for the oblivious equilibrium (Weintraub et al. (2008)). In this equilibrium, bidders consider only their valuation and the long run average market state when they bid. I prove the stochastic stability and the existence of an equilibrium. The equilibrium yields a closed form solution for the bid function in which bidders shade their bids by their continuation values. I demonstrate that the model is identified (modulo the discount factor) from the data of bidder identities and the second highest bid. Based on the identification result, an estimation procedure is developed. Monte Carlo simulations of estimation suggest the estimator works well with a limited amount of data if the true values of the entry and exit parameters are moderate. I apply the model to a data from a Japanese online auction website. The estimation results suggest that market dynamics are important. The estimate of the valuations obtained when each auction is treated independently is 23% smaller than the estimates obtained from the dynamic model.

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