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Pro-competitive rationing in multi-unit auctions

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A wide range of products, commodities and assets is traded in multi-unit auctions and exchanges. For instance, auctions of electricity, treasury bills and emission permits as well as financial exchanges all allow bids for more than one unit of the traded items. Multi-unit auctions and exchanges need to specify rationing rules for cases with ties, i.e. when there are two or more bidders that have a bid price at the marginal bid, which is on the margin of being accepted. This paper introduces a new rationing rule that results in more competitive bids. This benefits the auctioneer and/or results in a more efficient allocation of traded items. The improvement is particularly large for auctions and exchanges where bid prices accumulate at a few price levels, as usually happens in financial markets.

In practice, the normal procedure is to only ration marginal bids, which have a bid price exactly at the clearing price. In auctions where all bids are cleared simultaneously, it is standard practice to ration marginal bids pro-rata, so that the same percentage of its marginal bid quantity is accepted for each bidder. In exchanges with continuous trading, it is common to give priority to marginal bids that arrived early at the exchange (price-time priority), but pro-rata on the margin rationing is used also in exchanges.

Bidding is strategic, especially when there are few bidders. Bidders can increase their payoff by overstating their costs in their bids to sell and understating their valuation in their bids to buy. The paper uses a theoretical model to evaluate the bidding behaviour for different rationing rules. As in electricity auctions, security auctions and stock exchanges etc., each bidder can submit multiple bids with different bid prices. It is assumed that each bidder chooses its bids in order to maximize its profit.

It is shown that an auctioneer can increase its surplus by rationing marginal bids non-proportionally. Bidding gets closer to the competitive outcome when the auction gives disproportionate priority to sellers with a large volume of marginal bids at low clearing prices and disproportionate priority to sellers with a small volume of marginal bids at high clearing prices. Analogously, bids to buy become more competitive if the rationing rule gives disproportionate priority to buyers with a large volume of marginal buy bids at high clearing prices and disproportionate priority to buyers with a small volume of marginal buy bids at low clearing prices.

The improvement is particularly large for auctions and exchanges where bids tend to accumulate at a few price levels, which is often the case in financial exchanges, frequent batch auctions and auctions of financial securities. In case bids accumulate at only two price levels, the new rationing rule has the same effect on competitiveness as if the number of bidders increases from N to $2N$-1.