Extended Abstract
for
Second-Chance Offers

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December 14, 2011

eBay has become one of the most important market places for retail goods worldwide. Yet important aspects of the strategic bidding incentives in eBay auctions remain unexplored. eBay's main sales mechanism is closely related to a second-price auction, which has been extensively studied. There are, however important difference to a standard second-price auction. In particular, the eBay auction allows the seller to sell multiple units of the same good.[1] While the seller is committed to sell the first unit to the highest bidder at essentially the second-highest bid, she also retains the option to make "second-chance offers". She may offer a second unit to the second-highest bidder at the second-highest bid, a third unit to the third-highest bidder at the third-highest bid, and so on.

The opportunity to make second-chance offers raises a number of interesting questions. In particular, what is the impact of second-chance offers on the seller's revenue, the buyers' welfare, and on the aggregate welfare of all market participants? And: does the eBay mechanism have optimality properties as a multi-unit auction, parallel to the well-known optimality properties of the second-price auction mechanism in a single-unit world?

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[1] Another important difference is that eBay allows sequential bids. The sequentiality, however, does not play a crucial role in the private-value environments that we consider.

We consider a setting in which buyers have symmetric independent private values. We believe the symmetry assumption fits well to the largely anonymous trading environment in which eBay auctions take place. Also, the assumption that each buyer demands at most one unit is reasonable in many contexts. We focus on regular environments in the sense of Myerson (1981).

In a given auction, the seller may set a minimum bid, and decides about second-chance offers depending on the observed bids. We characterize a symmetric bidding equilibrium, taking into account the buyers' uncertainty about the seller's endowment (i.e., number of units available). The equilibrium bid function is strictly increasing in the buyer's willingness to pay (her "type"). The seller chooses an optimal minimum bid and optimal threshold bids for a second-chance offer, third-chance offer, and so on, depending on her cost function.

Our first main result assumes that the seller has a constant marginal cost function (i.e., each unit of the good has the same cost) and that the buyers know the seller's endowment. Here, the eBay auction with an optimal minimum bid maximizes the seller's expected profit among all (multi-unit) sales mechanisms. At the optimal minimum bid, a buyer's virtual valuation equals the seller's marginal cost. Second-chance offers are made at the second-highest bid, third-highest bid, and so on, until the seller's endowment is depleted. While the seller-optimality of this allocation follows from a straightforward multi-unit extension of the revenue-equivalence theorem, we believe it has not been reported before and sets an important benchmark. In particular, a different auction format where where the seller is not bound to auction bids, but can freely choose second-chance offer prices (Joshi et al. (2005), Salmon and Wilson (2008), Sun et al. (2009)) will—in equilibrium—be harmful to the seller because of the resulting distortion of the allocation away from the optimal one.

Complications arise if the marginal cost function is increasing. In this case, the seller will make a second-chance offer only if the observed bid is higher than the marginal cost of the unit that is currently at stake. This obviously changes the buyers' incentives towards bidding more aggressively. In particular, a buyer type who obtains a second-chance offer with probability 0 will bid her value. This complicates the derivation of the seller's optimal minimum bid.

Also, if the marginal cost function is increasing, then a seller-optimal sales mechanism would include the announcement of a minimum bid for selling the second unit (higher than the minimum bid for the first unit), another minimum bid for the third unit, and so on. This cannot be achieved via the eBay auction. Hence, the eBay auction will not be a seller-optimal sales mechanism anymore if the marginal cost function is increasing.

Another important direction of departure from the benchmark setting is to allow buyers to be uncertain about the seller's endowment. This is a typical situation that buyers face in a huge anonymous market place. The buyers' uncertainty about the seller's endowment raises the possibility that the seller's minimum bid may signal the seller's private information. We study this signaling problem in a model in which the seller has an endowment of one or two units.

So far we have focussed on a static environment in which the seller keeps the units that she fails to sell through her auction. This fits the sale of perishable goods such as concert tickets. For the sale of durable goods, however, it makes more sense to consider a dynamic environment. Here, we make the simplifying assumption that the seller is much more patient than the buyers. If the seller fails to sell all her units, then she waits for some time, until a new set of buyers has arrived, and holds another auction. Again, we believe that this assumption captures well a huge anonymous market place like eBay.

The major reason to consider the dynamic environment is, however, not the added realism, but rather that it allows us to endogenize the seller's opportunity cost function as well as the buyers' uncertainty about the seller's endowment. Assuming that the seller's own consumption value for the goods on sale is 0, the seller's opportunity cost function is endogenously determined by her expected continuation revenue from future auctions. Furthermore, assuming common knowledge about the seller's initial endowment, the buyers' uncertainty about the seller's current endowment arises endogenously from the probability of selling various amounts in any given auctions.

We study the dynamics in a two period model in which the seller initially has an endowment of one or two units, and in which she cannot use a minimum bid.

References

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