Getting Carried Away in an Auction as Imperfect Value Discovery

November 7, 2004. Eric Rasmusen[1]

The two possible bidders in an auction, both risk-neutral, have private values which are statistically independent. The auction is open and ascending.

Bidder 1's value is v_1, which has three components: $v_1 = \mu + u + \epsilon$. He knows the value of μ, and he knows that that u and ϵ are independently distributed with mean zero and differentiable densities on $[-\overline{u}, \overline{u}]$ and $[-\overline{\epsilon}, \overline{\epsilon}]$, where $\mu - \overline{u} - \overline{\epsilon} > 0$ so v_1 is never negative. If he wishes, at any time he can pay c and learn the value of u immediately. He cannot discover the other component, ϵ, however, until after the auction.

Bidder 2's value, v_2, is $\underline{v_2}$ with probability θ and $\overline{v_2}$ with probability $(1-\theta)$, with $\theta \in (0,1)$; and with $\underline{v_2} \in (\mu - \overline{u}, m)$ and $\overline{v_2} \in (m, \mu + \overline{u})$. Let us assume, for reasons to be explained later, that $\overline{v_2}$ is closer to μ than is $\underline{v_2}$: $\overline{v_2} - \mu > \mu - \underline{v_2}$. Bidder 2 knows the value of v_2 but not v_1.

Bidder 1 has three value discovery strategies that might be optimal in equilibrium: early discovery, late discovery, and no discovery. The early discovery strategy is to pay to discover u when the bid level reaches some value $b^* \in [0, \underline{v_2})$, most simply at the start of the auction, so $b^* = 0$. The late discovery strategy is to pay to discover u if the bid level reaches some level $b^* \in [\underline{v_2}, \mu + \overline{u}]$ and Bidder 2 has failed to drop out, most simply if the bidding reaches Bidder 1's initial bid ceiling, so $b^* = \mu$. The strategy of no discovery is to refuse to pay to discover u regardless of what happens.

Continuous Density Model. Now assume that Bidder 2's value, v_2, is distributed according to an atomless and differentiable density $g(v_2)$ on $[0, k]$, where $k > \mu$ and where $g(v_2) > 0$ for all v_2 on that interval. Bidder 2 does not know v_1, but he does know v_2.

Bidder 2's optimal strategy is to choose a bid ceiling of v_2, Bidder 1's optimal bid ceiling is Ex, which will be either μ or $\mu + u$, depending on whether he has paid c to discover u. Bidder 1 must also decide at what bid level p to pay c to discover u, where possibly $p = 0$ (early discovery) or $p = k$ (no discovery).

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