Correlation-Robust Auction Design[*]

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Abstract

We study the design of auctions when the auctioneer has limited statistical information about the joint distribution of the bidders' valuations. More specifically, we consider an auctioneer who has an estimate of the marginal distribution of a generic bidder's valuation but does not have reliable information about the correlation structure. We analyze the performance of mechanisms in terms of the revenue guarantee, that is, the greatest lower bound of revenue across all joint distributions that are consistent with the marginals. A simple auction format, the second-price auction with no reserve price, is shown to be asymptotically optimal, as the number of bidders goes to infinity. For markets with a finite number of bidders, we (1) solve for the robustly optimal reserve price that generates the highest revenue guarantee among all second-price auctions with deterministic reserve prices, and (2) show that a second-price auction with a random reserve price generates the highest revenue guarantee among all standard dominant-strategy mechanisms.

KEYWORDS: Robust mechanism design, correlation, second-price auction, low reserve price, duality approach, optimal transport.