

CERF Project Update – March 2022

Title

Building a robust combinatorial exchange for portfolio trading: a market design approach

Update on March 2022

Generalising the insights from the earlier simplified models, I develop a class of allocation rules and associated pricing rules which minimise marginal incentives to deviate from truth-telling. These rules generically fail to be incentive compatible (a fact which applies to all efficient and budget balanced trading protocols). However, under certain behavioural assumptions such as all agents being maxmin expected utility maximisers, this class of pricing rules can be shown to be incentive compatible. On the one hand such assumptions appear too strong. However, given the nature of uncertainty in some environments (perhaps better described as Knightian uncertainty), such behavioural assumptions are closer to reality than that of a common prior. Given the generic impossibility of efficient and budget balanced trade, these rules stand out as attractive solutions to robust pricing in complex markets.

Update on August 2021

Following up from the modelling approach mentioned below, I conceptualise a measure of “robustness to perturbations in bids” based on a definition of “marginal incentives to deviate from truthful bidding.” Roughly speaking, given an allocation and pricing rule, a bidder’s marginal incentive to deviate is computed by looking at the ratio of profits from a deviation divided by the size of the deviation. For example, for a potential buyer of a single indivisible object, this ratio is 1 if the rule is the first price auction, whereas it is 0 if the rule is the second price auction. For the half-double-auction, this incentive to deviate is $\frac{1}{2}$. Budget balanced and efficient pricing rules are typically not incentive compatible and in particular the marginal incentives to deviate cannot be always 0. Using the concept of marginal incentives to deviate we can in principle compare pricing rules according to their robustness to shading bids for buyers and inflating bids for sellers. For some class of problems, we can identify the most attractive pricing rules according to this criterion.

Update on March 2021

I have been developing the theoretical side of the project. More specifically, in highly stylised models I illustrate the shortcomings of trading protocols which do not allow package/portfolio bidding. While it is fairly standard to make the above point, it is far from obvious how to get around the issue. Abstracting away from computational issues, I advocate “core matching” to allow for the full possibility of gains for trades. Realising such trades, however, require specifying “core prices” which support these trades and ensuring that such a matching & pricing protocol is strategically implementable, i.e., incentive compatible. Noting the lack of incentive compatibility as a general impossibility in these environments, I turn my attention to the task of maximising participants’ incentives to bid as close as possible to their true values. I focus on pricing rules with a view towards

robustness to perturbations (small changes) in bids. Next, I need (would like) to develop a theoretical justification for specific pricing rules I identify as “robust”.