

A Short Course on Topics in Mechanism Design

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TOPIC 1: MECHANISM DESIGN AND VOTING

The first topic addresses the question: "What have we learned from the theory of mechanism design about voting rules?" The design of voting rules appears at first sight to be a very natural application of the theory of mechanism design. However, there are surprisingly few results in the theory of mechanism design about optimal voting rules. My plan is to explain some of what is known, and to discuss what the difficulties are. A consideration of these issues naturally raises some conceptual issues in the general theory of mechanism design which will be the subject of the subsequent two topics.

- (a) Strength of Preferences and Preference Aggregation
- (b) Voting Over 2 Alternatives
- (c) Voting Over at Least 3 Alternatives
- (d) Costly Voting

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A. Hylland, Strategy Proofness of Voting Procedures with Lotteries as Outcomes and Infinite Sets of Strategies, Working paper, University of Oslo.

P. W. Schmitz and T. Tröger, The (Sub-)Optimality of the Majority Rule, *Games and Economic Behavior* 72 (2012), 651-665.

TOPIC 2: ROBUSTLY RANKING MECHANISMS (PART 1)

This topic will present a first approach to the subject of robust mechanism design. This approach is based on the assumption that the mechanism designer, when contemplating a mechanism, can focus on just one Bayesian equilibrium of that mechanism. Robustness is interpreted as informational robustness. Thus, the mechanism designer considers a Bayesian equilibrium of any given mechanism on all possible type spaces (or on the "universal" type space). Before analyzing mechanism design theory from this perspective, we revisit some foundational issues in the theory of games with incomplete information. We then distinguish two questions: "Which allocation rules are incentive compatible?" and "How might a mechanism designer rank mechanisms?" Much less is known about the second question than about the first question. We put emphasis on the second question because the ultimate goal of the theory of mechanism design is to find a ranking of mechanisms that reflects the mechanism designer's objective, and to characterize mechanisms that are best in that ranking.

- (a) Type Spaces and Bayesian Equilibrium
- (b) Characterizing Incentive Compatibility
- (c) Rankings of Mechanisms Based on Uniform Comparisons
- (d) Bayesian Rankings of Mechanisms
- (e) Rankings of Mechanisms Based on Worst Case Comparisons

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K.-S. Chung and J. Ely, Foundations of Dominant Strategy Mechanisms, *Review of Economic Studies* 74 (2007), 447-476.

A. Heifetz and Z. Neeman, On the Generic (Im)possibility of Full Surplus Extraction in Mechanism Design, *Econometrica* 74 (2006), 213-233.

TOPIC 3: ROBUSTLY RANKING MECHANISMS (PART 2)

Whereas in Topic 2 we considered the traditional approach of mechanism design that allows the mechanism designer to choose a Bayesian equilibrium of the mechanism that she selects, in this topic we shall consider the case in which the mechanism designer needs to consider *all* Bayesian equilibria of the mechanism that she designs. This is often referred to as the "implementation" approach. In the robust setting it is closely related to the case in which the mechanism designer considers the result of iterated deletion of strictly dominated strategies (for an appropriate incomplete information setting), or the result of one round of deletion of weakly dominated strategies, when analyzing different mechanisms. We shall also consider again how a mechanism designer, using these solution concepts, might rank mechanisms.

- (a) Characterizing Implementability
- (b) Iterated Deletion of Strictly Dominated Strategies
- (c) Deletion of Weakly Dominated Strategies
- (d) Ranking Mechanisms

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