"Advanced Game Theory: Imperfect and Incomplete Information"

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These lectures aim at revisiting the standard approach to several strategic settings in which players' information is imperfect and/or incomplete. We will first present the relevant solution concepts for extensive form games, and then analyze the scenario in which players may have some commitment power. This allows to cover important issues in incentive theory and mechanism design. Our emphasis will be on economic applications. No background beyond an introductory course in game theory is required.

Outline

1 Extensive Form Games

- Extensive Form Games:

- Introducing incomplete information

- The relevant solution concepts

- Applications: Signalling and Bargaining Games

Reference:
($*$) Osborne M. and A. Rubinstein (2012): A Course in Game Theory, *MIT Press*, Chapters 6,11, and 12.

2 Intraplay and Preplay Communication

- Introducing new solution concepts: the extensive form correlated equilibrium and the communication equilibrium

References:
($*$) Forges, F. (1986): An Approach to Communication Equilibria, *Econometrica*, 54: 1375-1385.

($*$) Myerson, R. (1991): Game Theory: Analysis of Conflict, *Harvard Press*. Chapter 6.

- Myerson, R. (1986): Multistage Games with Communication, *Econometrica*, 54: 323-358.

- Sugaya, T. and A. Wolitzky (2021): The Revelation Principle in Multistage Games, *Review of Economic Studies*, 88: 1503–1540.

3 Static Contracting: the Role of Commitment

We move on to a class of Bayesian games in which an uninformed player (the principal) can commit to play some actions contingent on the communication he entertains with one or several privately informed agents.

3.1 One-sided private information problems

- Introduction to allocation mechanisms with transfers

- Incentive compatibility and revelation principle

- Application 1: Optimal Auctions

- Application 2: Optimal Regulation of a Firm

References:
Baron, D. P., & Myerson, R. B. (1982). Regulating a monopolist with unknown costs. *Econometrica: Journal of the Econometric Society,* 911-930.

Milgrom, P., & Segal, I. (2002). Envelope theorems for arbitrary choice sets. *Econometrica,* 70(2), 583-601.

($*$) Laffont, J. J., & Martimort, D. (2002). The Theory of Incentives: The Principal-Agent Model. Princeton university press – **Chapters 2 and 3**.

Myerson, R. B. (1981). Optimal auction design. *Mathematics of operations research,* 6(1), 58-73.

($*$) Krishna, V. (2009). Auction theory. Academic press – **Chapters 3 and 5**.

3.2 Two-sided private information problems

- Buyer-Seller relationships: Impossibility of efficient trade

- Partnerships and the role of initial ownership rights

- The challenges of designing markets with two-sided private information

References:
($*$) Bolton, P., & Dewatripont, M. (2004). Contract theory. MIT press – **Chapter 7**.

Cramton, P., Gibbons, R., & Klemperer, P. (1987). Dissolving a partnership efficiently. *Econometrica: Journal of the Econometric Society,* 615-632.

Myerson, R. B., & Satterthwaite, M. A. (1983). Efficient mechanisms for bilateral trading. *Journal of economic theory,* 29(2), 265-281.

Loertscher, S., Marx, L. M. & Wilkening T. (2015). A long way coming: Designing centralized markets with privately informed buyers and sellers. *Journal of Economic Literature* 53(4):857–897.

Remark: $(*)$ **are recommended readings**