

Spring 2006, UCLA Department of Economics

Economics 212b: Dynamic Games: *Recursive Methods and Its Application*

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Office Hour: By appointment

Time and Location:
Wednesday, 5:10pm~8:10pm, Bunche 2249

Textbooks:

- My lecture notes at <http://www.econ.ucla.edu/iobara/211b.html>.
- G. Mailath and L. Samuelson, *Repeated Games and Reputation: Long-Run Relationships*, Oxford, 2006 (in press).
Ch 1, 2, 6, 7, 8, 9 are available at
<http://www.econ.upenn.edu/~gmailath/book.html>
(the first accessible textbook on repeated games. Out in June).
- D. Pearce, *Repeated Games: Cooperation and Rationality*, in Volume I of *Advances in Economic Theory 6th World Congress*, Cambridge Press, 1992. (Old, but still the best place to start)
- D. Fudenberg and J. Tirole, *Game Theory*, MIT, 1991 (standard textbook on game theory).
- R. Myerson, *Game Theory: Analysis of Conflict*, Harvard, 1991 (many interesting topics missing from the above textbooks).

Grades:

Problem sets and a short paper to be submitted in the end of the quarter. The final grade will be based on them (60% on the problem sets and 40% on the paper).

Reading List: The lecture will proceed according to the order of the following reading list. I plan to talk about the papers with ** and *, although I may skip (*). I really recommend you to read the papers with **. You won't regret it. In making this list, I decided not to touch the issue of (persistent) incomplete information such as reputation, assuming that David covered some of them.

1. Repeated Games with Perfect Monitoring (Ch1, 2 of M&S)

Dynamic Programming Approach

- ** D. Abreu, D. Pearce, and E. Stacchetti (1990), "Toward a Theory of Discounted Repeated Games with Imperfect Monitoring," *Econometrica* 58.
- M. Cronshaw and D. Luenberger (1994), "Strongly Symmetric Subgame Perfect Equilibria in Infinitely Repeated Games with Perfect Monitoring and Discounting," *Games and Economic Behavior* 6. (Application of APS method to repeated games with perfect monitoring).
- K. Judd, S. Yeltekin, and J. Conklin (2003), "Computing Supergame Equilibria," *Econometrica* 71. (Algorithm to approximate the equilibrium payoff set).
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Monotonicity of Equilibrium Payoff Set

- *S. Sorin (1986), "On Repeated Games with Complete Information," *Mathematics of Operations Research* 11 (When are all payoffs really feasible? A simple example of non-monotonicity based on infeasibility).
- D. Stahl (1991), "The Graph of Prisoners' Dilemma Supergame Payoffs as a function of the Discount Factor," *Games and Economic Behavior* 3. (monotonicity with public randomization device).
- *J. Mailath, I. Obara, T. Sekiguchi (2002), "The Maximum Efficient Equilibrium Payoff in the Repeated Prisoners' Dilemma," *Games and Economic Behavior* 40 (severe non-monotonicity without public randomization device).

Folk Theorem

- ** D. Fudenberg and E. Maskin (1986), "The Folk Theorem in Repeated Games with Discounting or with Incomplete Information," *Econometrica* 54.
- D. Fudenberg and E. Maskin (1991), "On the Dispensability of Public Randomization in Discounted Repeated Games," *Journal of Economic Theory* 53(2).
- * D. Abreu, P. Dutta, and L. Smith (1994), "The Folk Theorem for Repeated Games: A NEU Condition," *Econometrica*, 62. (Relaxing the full dimensionality in FM to NEU).
- * Q. Wen (1994), "The "Folk Theorem" for Repeated Games with complete Information," *Econometrica* 62. (When NEU is violated, the relevant minmax is effective minmax).

Penal Code

- *D. Abreu (1988), “On the Theory of Infinitely Repeated Games with Discounting,” *Econometrica*, 56. (Penal code. The compactness of equilibrium payoff set with compact action sets and continuous payoffs)

Finitely Repeated Games

- *J. Benoit and V. Krishna (1985), “Finitely Repeated Games,” *Econometrica*, 53(4). (Folk Theorem with observable mixed strategy)
- L. Smith (1995), “Necessary and Sufficient Conditions for the Perfect Finite Horizon Folk Theorem,” *Econometrica*, 63(2). (Necessary and sufficient condition for Folk Theorem).
- O. Gossner (1995), “The Folk Theorem for Finitely Repeated Games with Mixed Strategies,” *International Journal of Game Theory*, 24. (Folk theorem without observable mixed strategies).

Renegotiation in Repeated Games

- D. Bernheim and D. Rey (1989), “Collective Dynamic Consistency in Repeated Games,” *Games and Economic Behavior*, 1(4).
- J. Farrell and E. Maskin (1989), “Renegotiation in Repeated Games,” *Games and Economic Behavior*, 1(4).
- D. Abreu, D. Pearce, and E. Stacchetti (1993), “Renegotiation and Symmetry in Repeated Games,” *Journal of Economic Theory*, 60(2).

2. Applications (1) (Ch6 of M&S)

Price Wars

- ** J. Rotemberg and G. Saloner (1986), “A Supergame-Theoretic Model of Price Wars during Booms,” *American Economic Review* 76.

(For non i.i.d. demand shocks)

- K. Bagwell and R. Staiger (1997), “Collusion over the Business Cycle,” *RAND Journal of Economics* 28.
- J. Haltiwanger and J. Harrington (1991), “The impact of Cyclical Movements in Collusive Behavior,” *RAND Journal of Economics*, 22.
- M. Kandori (1991), “Correlated Demand Shocks and Price Wars during Booms,” *Review of Economic Studies*, 58.

Risk Sharing without Commitment

- J. Thomas and T. Worrall (1988), “Self-Enforcing Wage Contracts,” *Review of Economic Studies* 55
- ** N. Kocherlakota (1996), “Implications of Efficient Risk Sharing without Commitment,” *Review of Economic Studies* 63.

- L. Ljungqvist and T.J. Sargent (2000), “Recursive Macroeconomic Theory,” Ch 15.
- *A. Dixit, G. Grossman, and F. Gul (2000) “A Theory of Political Compromise”, *Journal of Political Economy*, 108. (Application to Political Economy).

Time Inconsistency

- F. Kydland and E. Prescott (1977), “Rules Rather than Discretion,” *Journal of Political Economy*, 85 (3).
- *V. Chari and P. Kehoe (1990), “Sustainable Plans,” *Journal of Political Economy*, 98(4).
- V. Chari and P. Kehoe (1993), “Sustainable Plans and Mutual Default,” *Review of Economic Studies*, 60(1).

3. Repeated Games with Imperfect Monitoring (Ch6,7,8,9 of M&S)

Dynamic Programming Approach

- **D. Abreu, D. Pearce, and E. Stacchetti (1990), “Toward a Theory of Discounted Repeated Games with Imperfect Monitoring,” *Econometrica* 58.

Folk Theorem

- *R. Radner, R. Myerson and E. Maskin (1986), “An Example of a Repeated Partnership Game with Discounting and with Uniformly Inefficient Equilibria,” *Review of Economic Studies* 53 (Anti-Folk Theorem Example)
- * D. Fudenberg, D. Levine and E. Maskin (1994), “The Folk Theorem with Imperfect Public Information,” *Econometrica* 62(5).
- ** D. Fudenberg and D. Levine (1994), “Efficiency and Observability with Long-Run and Short-Run Players,” *Journal of Economic Theory* 62(1).

Private Strategies

- G. Mailath, S. Matthews, and T. Sekiguchi (2002), “Private Strategies in Finitely Repeated Games with Imperfect Public Monitoring,” *Contributions to Theoretical Economics*, 2(1), Article 2.
- ** M. Kandori and I. Obara (2006), “Efficiency in Repeated Games Revisited: the Role of Private Strategies,” *Econometrica*, 74(2).

Timing of Information

- *D. Abreu, P. Milgrom and D. Pearce (1991), “Information and Timing in Repeated Partnerships” *Econometrica*, 59.

4. Applications (2)

Price Wars

- *E. Green and R. Porter (1984), “Noncooperative Collusion and under Imperfect Price Information,” *Econometrica* 52. (Equilibrium price war)

- D. Abreu, D. Pearce, and E. Stacchetti (1990), “Optimal Cartel Equilibrium with Imperfect Monitoring,” *Journal of Economic Theory* 39. (characterization of the optimal collusive (two state) equilibrium)

Collusion in Repeated Auction

(Background)

- D. Graham and R. Marshall (1987), “Collusive Bidder Behavior at Single-Object, Second-Price and English Auctions,” *Journal of Political Economy* 95.
- R. McAfee and J. McMillan (1992), “Bidding Rings,” *American Economic Review* 82.

(Tacit Collusion)

- S. Athey and K. Bagwell (2001), “Optimal Collusion with Private Information,” *RAND Journal of Economics*, 32(3).
- **S. Athey, K. Bagwell, and C. Sanchirico (2004), “Collusion and Price Rigidity,” *Review of Economic Studies*, 71(2).
- Skrzypacz and H. Hopenhayn (2004), “Tacit Collusion in Repeated Auctions,” *Journal of Economic Theory* 114.
- *S. Athey and K. Bagwell (2004), “Collusion with Persistent Cost Shocks,”
- A. Blume and P. Heidhues (2006), “Private monitoring in Repeated Auctions,” forthcoming in *Journal of Economic Theory*.

(With Communication)

- M. Aoyagi (2003), “Bid Rotation and Collusion in Repeated Auctions,” *Journal of Economic Theory* 112.

Relational Contract

- J. Levin (2003), “Relational Contracts,” *American Economic Review* 93.
- G. Baker, R. Gibbons and K. Murphy (2002), “Relational Contracts and the Theory of the Firm”, *Quarterly Journal of Economics*, 117.

4. Dynamic Games

Asynchronous Repeated Games

- *R. Lagunoff and A. Matsui (1997), “Asynchronous Choice in Repeated Games,” *Econometrica*, 65(6).

Folk Theorem

- P. Dutta (1995), “A Folk Theorem for Stochastic Games,” *Journal of Economic Theory*, 66(1).

5. Repeated Games with Private Monitoring

Survey

- **M. Kandori (2002), “Introduction to Repeated Games with Private Monitoring,” *Journal of Economic Theory* 102.

Folk Theorem

- T. Sekiguchi (1997), “Efficiency in Repeated Games Prisoner’s Dilemma with Private Monitoring,” *Journal of Economic Theory* 76. (The first efficiency result).
- **V. Bhaskar and I. Obara (2002), “Belief-based Equilibria in the Prisoner’s Dilemma with Private Monitoring,” *Journal of Economic Theory* 102 (Folk Theorem for PD with almost perfect private monitoring: Belief-based approach).
- **J. Ely and J. Valimaki (2002), “A Robust Folk Theorem for the Prisoner’s Dilemma,” *Journal of Economic Theory* 102. (Folk Theorem for PD with almost perfect private monitoring: Belief-free approach).
- Matsushima (2003), “Repeated Games with Private Monitoring: Two players,” *Econometrica* 72. (Folk Theorem for PD with conditionally independent private monitoring).
- J. Ely, J. Horner, and W. Olszewski (2005), “Belief-Free Equilibria in Repeated Games,” *Econometrica* 73. (Extension of Ely and Valimaki to general games).
- J. Horner, and W. Olszewski (2005), “The Folk Theorem for Games with Perfect Almost-Perfect Monitoring (folk Theorem with almost perfect private monitoring for general stage games).

Folk Theorem with Communication

- *Compte (2000), “Communication in Repeated Games with Imperfect Private Monitoring,” *Econometrica* 66.
- *M. Kandori and H. Matsushima (2000), “Private Observation, Communication and Collusion,” *Econometrica* 66.
- D. Fudenberg and D. Levine (2005), “The Nash Threats Folk Theorem with Communication and Approximate Common Knowledge in Two Player games”, forthcoming in *Journal of Economic Theory*.
- I. Obara (2005), “Folk Theorem with Communication,” mimeo.

6. Repeated Games in Continuous Time

- J. Bergin and B. McLeod (1993), “Continuous Time Repeated Games,” *International Economic Review*, 34(1).
- *Y. Sannikov (2004), “Games with Imperfectly Observable Actions in Continuous Time”.