Lecture 11
Single deviation-principle

14.12 Game Theory

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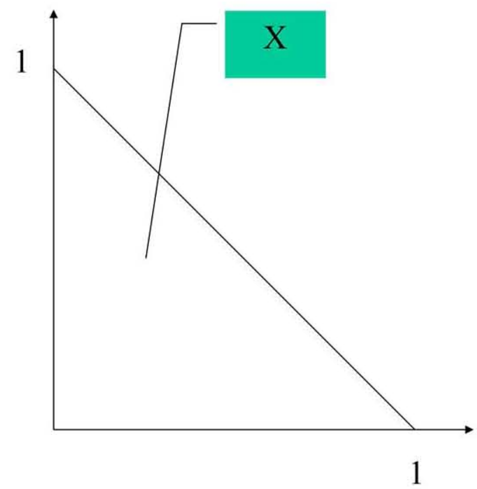
Road Map

1. Definition: Single-deviation principle
2. Application: Infinite-horizon bargaining
3. Problem Solution?
4. Evaluations

Single-Deviation Principle

- Consider a "multi-stage" game that is "continuous at infinity."
- $s = (s_1, s_2, \ldots, s_n)$ is a SPE
- ⇔ it passes the following test
- for each information set, where a player *i* moves,
  - fix the other players' strategies as in *s*,
  - fix the moves of *i* at other information sets as in *s*;
  - then *i* cannot improve her conditional payoff at the information set by deviating from s_i at the information set only.

Sequential Bargaining



- $N = \{1,2\}$
- X = feasible expected-utility pairs $(x,y \in X)$
- $U_i(x,t) = \delta_i^t x_i$
- $d = (0,0) \in X$ disagreement payoffs

Timeline – ∞ period

$T = \{1,2,\ldots, n-1,n,\ldots\}$

If t is odd,

- Player 1 offers some (x_t,y_t),
- Player 2 Accept or Rejects the offer
- If the offer is Accepted, the game ends yielding $\delta^t(x_t,y_t)$,
- Otherwise, we proceed to date t+1.

If t is even

- Player 2 offers some (x_t,y_t),
- Player 1 Accept or Rejects the offer
- If the offer is Accepted, the game ends yielding payoff $\delta^t(x_t,y_t)$,
- Otherwise, we proceed to date t+1.

SPE of ∞-period bargaining

Theorem: The following is a SPE:

At any *t*, proposer offers the other player $\delta/(1+\delta)$, keeping himself $1/(1+\delta)$, while the other player accepts an offer iff he gets at least $\delta/(1+\delta)$.

Proof

- Single-deviation principle:
- Take any t; i offers, j accepts/rejects.
- At $t+1$, j will get $1/(1+\delta)$.
- Hence, it is a best response for j to accept an offer iff she gets at least $\delta/(1+\delta)$.
- Given this, i must offer $\delta/(1+\delta)$.

14.12 Economic Applications of Game Theory
Fall 2012