Repeated Games

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Introduction

• Some relevant questions:
  – What happens when players interact again and again in a strategic setting?
  – Can cooperation be sustained between two players interacting strategically in a prisoners’ dilemma like situation?
  – What is the role of reputation and punishment in strategic interactions?
  – Sometime we exhibit ‘tit-for-tat’ response. Is it a good strategy?

• In a repeated game, a game (say G) is played multiple times
  – Stage Game: A single play of the game (G)
  – Each occurrence of G is called an iteration or a round.

• An Example: Repetition of Prisoners’ Dilemma
Repeated Game

• Two kinds of repeated games: Finitely repeated and infinitely repeated games.
• Finitely Repeated: Games with finite and known number of repetition.
• Infinitely Repeated: Games that continue for ever or Games that end at a random, unknown time
• Assumption: Players observe and remember the outcome of all previous stage games
• For every different observation of the outcomes of stage games, players could have a different response.
Repeated Prisoners’ Dilemma

- Example: Repeated Prisoners’ Dilemma

Cooperate = Remain Silent and Defect = Confess.

- Only one pure strategy NE at (Defect, Defect).
- If game is repeated T times. [T is a finite number]
  - How should we write the payoffs?
  - Are there any strategies possible that would sustain (C, C) as the equilibrium strategy in at least some of the iteration of the game?

<table>
<thead>
<tr>
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<th>Cooperate</th>
<th>Defect</th>
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<tbody>
<tr>
<td>Cooperate</td>
<td>2,2</td>
<td>0,3</td>
</tr>
<tr>
<td>Defect</td>
<td>3,0</td>
<td>1,1</td>
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Twice Repeated Prisoners’ Dilemma

• Two players play Prisoners’ dilemma twice.
• Before the second stage game, each knows the outcome of the first stage game.
• Assumption: Payoff is the sum of earnings on the two stages.
• How to solve it?
  – Extensive form representation.
Extensive Form Representation
Finitely Repeated Prisoners Dilemma

• What is the equilibrium outcome [Subgame perfect] if Prisoners’ dilemma is repeated 1000 times?