Recap

- Games in normal form
  - NBS vs. ABC, Prisoner's dilemma, Tragedy of the commons
  - Dominant or dominated actions, outcomes
  - Best response, Nash equilibrium (pure vs. mixed strategy)
- Duopoly models
  - Cournot, Stackelberg, Bertrand; comparison with monopoly
- Multi-stage games with observed actions
  - Stackelberg, Strategic investment
  - Extensive form of a game, information sets
  - Subgame-perfect Nash equilibrium
- Repeated games (finitely or infinitely)
  - Prisoner’s dilemma, Cournot competition
  - Trigger strategies, Friedman’s theorem

Example: One-card poker

- A player is dealt an ace or king with equal probability
Example: One-card poker

- Two players
- One deck of cards, half aces, half kings
- Pay $a to play
- Each player is dealt a card face down
- After seeing his/her card, each player (simultaneously)
  - Action B: bets b, or
  - Action P: passes

Payoffs
- (B,P) or (P,B) $\rightarrow$ betting player gets the pot
- (B,B) or (P,P) $\rightarrow$ higher card gets the pot; in case of a tie, the pot is split

Record the results

<table>
<thead>
<tr>
<th>Player 1</th>
<th>Player 2</th>
<th>Payoffs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Game 1</td>
<td>Ace-Bet</td>
<td>King-Bet</td>
</tr>
<tr>
<td>Game 2</td>
<td>King-Pass</td>
<td>King-Bet</td>
</tr>
<tr>
<td>Game 3</td>
<td>King-Pass</td>
<td>King-Pass</td>
</tr>
<tr>
<td>etc</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The payoffs depend on players’ actions and on card combinations.

Need to compute expected payoffs for each outcome.
Example: One-card poker (cont.)

- Payoffs for outcome (B,B) under different card combinations

<table>
<thead>
<tr>
<th>Card combination</th>
<th>Probability</th>
<th>Payoffs</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A,A)</td>
<td>0.25</td>
<td>(0,0)</td>
</tr>
<tr>
<td>(A,K)</td>
<td>0.25</td>
<td>(a+b, -a-b)</td>
</tr>
<tr>
<td>(K,A)</td>
<td>0.25</td>
<td>(-a-b,a+b)</td>
</tr>
<tr>
<td>(K,K)</td>
<td>0.25</td>
<td>(0,0)</td>
</tr>
</tbody>
</table>

- Expected payoff for player 1:
  \[(0.25)(0)+(0.25)(a+b)+(0.25)(-a-b)+(0.25)(0)=0\]
- Similarly, expected payoff for player 2 is 0
- Expected payoffs for (B,B) = (0,0)

One-card poker in normal form

<table>
<thead>
<tr>
<th>Player 1</th>
<th>Player 2</th>
<th>Bet</th>
<th>Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bet</td>
<td>0, 0</td>
<td>a, -a</td>
<td></td>
</tr>
<tr>
<td>Pass</td>
<td>-a, a</td>
<td>0, 0</td>
<td></td>
</tr>
</tbody>
</table>

- The unique NE is (B,B)