Last time:
- Info sets: imperfect information
- Strategies: instructions for each info set
- Subgames: game within games
- Subgame perfection: NE in every subgame

Today Examples

DON'T SCREW UP

\[
\begin{array}{ccc}
 & u & 4,3 \\
D & 2 & 1 \\
D & u & 3,1 \\
D & d & 3,1 \\
\end{array}
\]

\[
\begin{array}{ccc}
 & u & 4,3 \\
 & d & 3,1 \\
 & 1,2 \\
\end{array}
\]

\[
\begin{array}{ccc}
 & [u, e] & [d, r] \\
0 & \checkmark & \times \\
1 & \checkmark & \checkmark \\
\end{array}
\]

\[
\begin{array}{ccc}
 & l & r \\
 & u & 4,3 \\
 & d & 3,1 \\
\end{array}
\]

\[
\begin{array}{ccc}
 & l & r \\
 & 1,2 \\
 & 1,2 \\
\end{array}
\]

\[\text{pure NE: } [u, e] \]

\[\Rightarrow \text{2 is eliminated since it induces non-NE play in this subgame.}\]

\[\therefore \text{The only SPE is } [u, e].\]

NB: This is the BI prediction.

Matchmaker Game

\[
\begin{array}{ccc}
 & G & S \\
 & 1,2,1 & -1,0,0 \\
 & -1,0,0 & 1,1,2 \\
\end{array}
\]

\[
\begin{array}{ccc}
 & G & S \\
 & 1,2,1 & -1,0,0 \\
 & -1,0,0 & 1,1,2 \\
\end{array}
\]

\[\text{pure NE: } (G, G), (S, S)\]

both yield a value of 1 for player 1.

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In the subgame, there is a mixed NE
\[
\left( \frac{2}{3}, \frac{1}{3} \right), \left( \frac{1}{3}, \frac{2}{3} \right)
\]

If Jake sends Dave and Nina then they meet with \( \frac{2}{9} \), \( \frac{2}{9} = \frac{4}{9} \) probability and hence fail to meet with prob = \( \frac{5}{9} \).

Value to Jake of this NE is \( \frac{N}{q} [1] + \frac{S}{q} [-1] = -\frac{1}{q} \)

SPE = (not, mix, mix)

2 Firms Cournot
\[
p = 2 - \frac{1}{3} [q_A + q_B] \]

MC = $1 a ton

\[
q^* = \frac{a - c}{3b} = \frac{2 - 1}{3} = \frac{1}{3} \] million tons

Profit:

\[
[3 \cdot \frac{1}{3} - 1] \] M = \$1 M per firm

New machine

- only works for A
- costs \$0.7 M per year
- it lowers A's costs to \$0.5 per ton

To Rent or not Rent?

(1) Accountants Answer
produce 1M tons per year
save \$0.5M a year
save 50c per ton
in variable cost

Cost of machine:
fixed cost of \$0.7 M
\( S < T \) => So (NOT RENT)

(2) Econ 115 Answer

\[ \text{residual demand curve} \]

\[ \text{residual MR, residual demand curve} \]

\[ \text{missed triangle has area} \ \frac{3}{16} \]

\[ S + 0.19 = 0.69 < 0.7 \]

So (NOT RENT)

(3) Game Theory Answer aka the right answer

\[ \text{old BRA} \]

\[ \text{new BRA} \]

\[ q_A \uparrow \] (econ answer)

\[ q_B \downarrow \]

\[ \text{strat sub firm} \]

This is good for A

We could calculate the new NE

\[ \text{subgame is BR-diagram above} \]

<<do this at home>>

we get extra \$0.31 + \$0.69 = \$1 M + \$0.7 M

RENT

Lessons:
1) solve out lower subgames, roll back

- Cournot symmetric

- Cournot asymmetric

2) strategic effect - don't forget them!

- tax code, curriculum design

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