Lecture 9
Negotiation

14.12 Game Theory

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Examples of Bargaining

- Buying a car, house, or shopping at a bazaar
- Wage Negotiations
- International Agreements
- Legislative Bargaining
- Litigation

Road Map

1. Congressional Bargaining & Agenda Setting
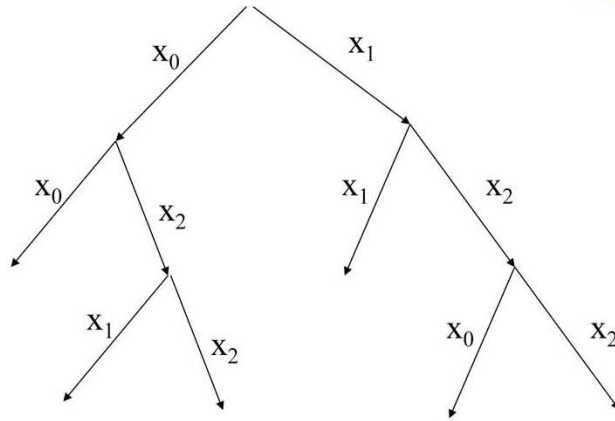2. Pretrial Negotiations
3. Bargaining over a dollar

Agenda Setting

Voting with a fixed agenda

1. $2n+1$ players
2. Alternatives: $x_0, x_1, \ldots, x_m$
3. Each player i has a fixed strict preference about alternatives: $x_{i0} >_i x_{i1} >_i \ldots >_i x_{im}$
4. There is a fixed binary agenda.
5. Assume: everything above is common knowledge

A binary agenda

A preference profile

1	2	3
x_0	x_2	x_1
x_1	x_0	x_2
x_2	x_1	x_0

Naïve Voting

Sophisticated Voters

17th Amendment

- x_0 = status quo
- x_1 = 17th amendment
- x_2 = DePew Amendment

Preference profile

1	2	3
x_0	x_2	x_1
x_2	x_1	x_0
x_1	x_0	x_2
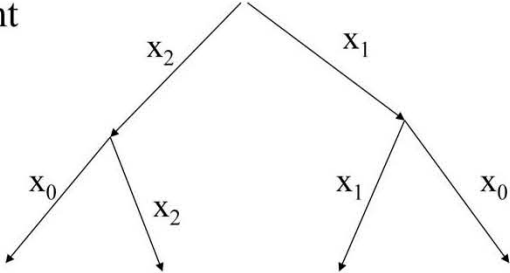
Pretrial Negotiation

Model

- Players:
  - Plaintiff
  - Defendant
- In court Defendant is to pay *J* to Plaintiff
- Cost of court
  - C_P; C_D; $C = C_P + C_D$
- Lawyer cost per day:
  - c_p; c_d; $c = c_p + c_d$

Assume: players are risk neutral and no discounting.

Timeline – 2n period

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

If $t < 2n$ is odd,

- Defendant offers settlement s_t
- Plaintiff Accept or Rejects the offer
- If the offer is Accepted, Plaintiff pays s_t to the Defendant and the game ends
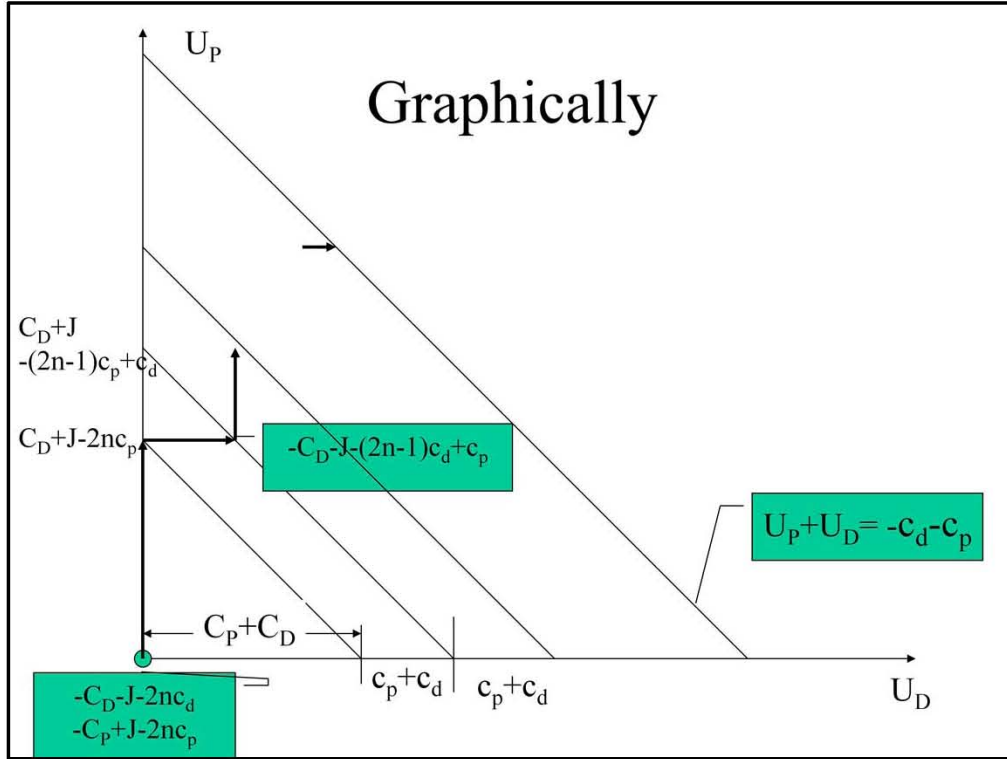- Otherwise, we proceed to date $t+1$.

If t is even

- Plaintiff asks settlement s_t
- Defendant Accept or Rejects
- If he accepts, Plaintiff pays s_t to the Defendant and the game ends
- Otherwise, we proceed to date $t+1$
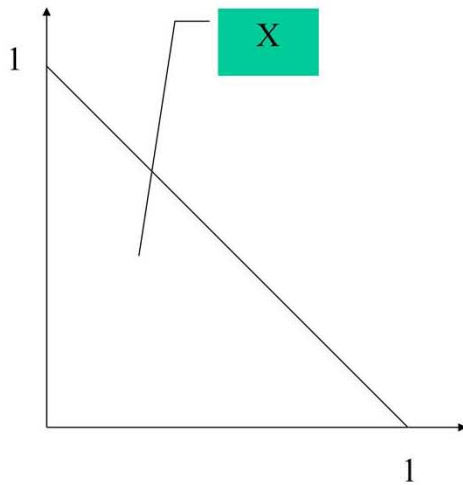
At $t=2n+1$, they go to court

Backwards Induction

Date	Proposer	Settlement
2n	P	
2n-1	D	
2n-2	P	
2n-3	D	
2n-4	P	
2n-5	D	
…		
2	P	
1	D	

Graphically

U_P

U_D

C_D+J
$-(2n-1)c_p+c_d$

$C_D+J-2nc_p$

-C_D-J-$(2n-1)c_d$+c_p

$U_P+U_D= -c_d-c_p$

C_P+C_D

c_p+c_d

c_p+c_d

-C_D-J-$2nc_d$
-C_P+J-$2nc_p$

Sequential Bargaining

Sequential Bargaining

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

Timeline – 2n period

T = {1,2,…,2n-1,2n}

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 $\delta^t(x_t, y_t)$,
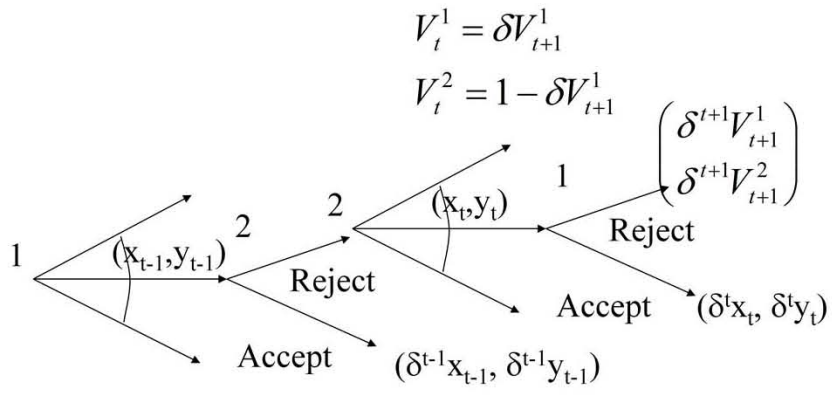- Otherwise, we proceed to date t+1.

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, except at t = 2n, when the game end yielding (0,0).
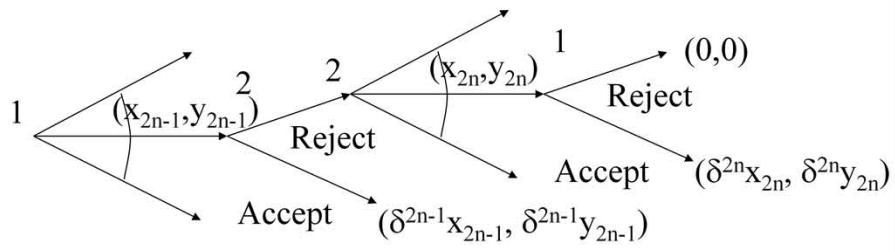
At t = 2n-1,
- Accept iff
- Offer

At t = 2n,
- Accept iff
- Offer

The share of i at t+1 = V_{t+1}^i

$$V_t^1 = \delta V_{t+1}^1$$

$$V_t^2 = 1 - \delta V_{t+1}^1$$

$$\begin{pmatrix} \delta^{t+1} V_{t+1}^1 \\ \delta^{t+1} V_{t+1}^2 \end{pmatrix}$$

Reject

1

(x_t, y_t)

2

Reject

$(\delta^t x_t, \delta^t y_t)$

Accept

(x_{t-1}, y_{t-1})

2

1

Accept

$(\delta^{t-1} x_{t-1}, \delta^{t-1} y_{t-1})$

$$V^1_{2n-2k-1} = 1 - \delta + \delta^2 V^1_{2n-2k+1}$$

$$= 1 - \delta + \delta^2\left(1 - \delta\right) + \delta^4 V^1_{2n-2k+3}$$

$$= 1 - \delta + \delta^2\left(1 - \delta\right) + \delta^4\left(1 - \delta\right) + \delta^6 V^1_{2n-2k+5}$$

$$\vdots$$

$$= \left(1 - \delta\right)\left(1 + \delta^2 + \delta^4 + \cdots + \delta^{2k}\right)$$

$$= \frac{1 - \delta^{2k+1}}{1 + \delta}$$

14.12 Economic Applications of Game Theory
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