Mixed Games

ECON 420: Game Theory

Spring 2018

Mixed simultaneous and sequential games

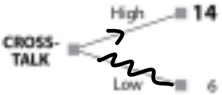
- Real world games are often combinations of sequential and simultaneous games
- We can use a combination of roll-back and best response analysis to find NE of these games

First stage:
investment game

		GLOBALDIALOG Don't	GLOBALDIALOG Invest
CROSS-TALK	Don't	0, 0	0, 14
CROSS-TALK	Invest	14, 0 *	−2, −2

Second stage:
GlobalDialog's pricing decision

Second stage:
CrossTalk's pricing decision



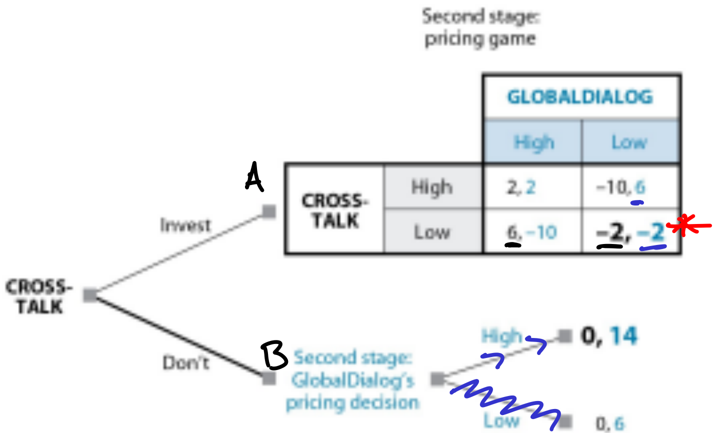
Second stage:
pricing game

		GLOBALDIALOG High	GLOBALDIALOG Low
CROSS-TALK	High	2, 2	−10, 6
CROSS-TALK	Low	6, −10	−2, −2 *

		GLOBALDIALOG	
		Don't	Invest
CROSSTALK	Don't	0, 0	0, 14 *
	Invest	14, 0 *	−2, −2

Equ. strategy for crosstalk:

(invest, low if GD invests, high if GD doesn't)



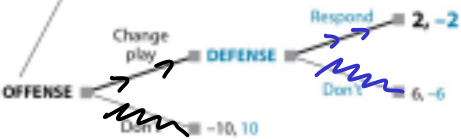
Crosstalk: (Don't invest, Low)

GD: (low if invest, high if Don't)

First stage:
coaches choose alignment

		DEFENSE TO COVER	
		Safe	Risky
OFFENSE TO PLAY	Safe	2, −2	6, −6
	Risky	30, −30	2, −2

→ no pure strategy NE.



Simultaneous as sequential

- Simultaneous games with multiple equilibria might have different outcomes if played sequentially (change the rules of the game)
- Payoffs may be better for one of the players depending on move order
  - First or second mover advantages

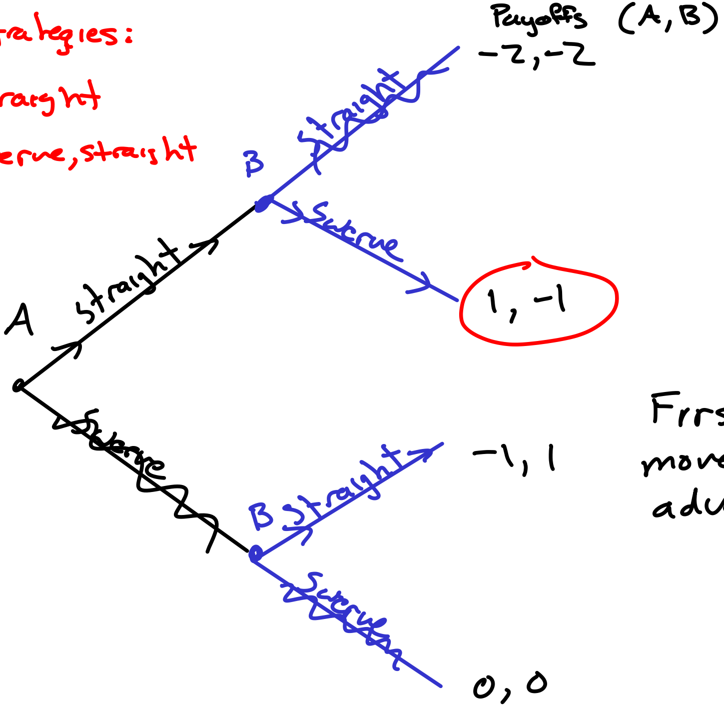
Example: Chicken (6.5)

		B	
		Swerve	Straight
A	Swerve	0, 0	$\underline{-1}$, $\underline{1}$ *
	Straight	$\underline{1}$, $\underline{-1}$ *	-2, -2

Eq. Strategies:

A: Straight

B: Swerve, straight

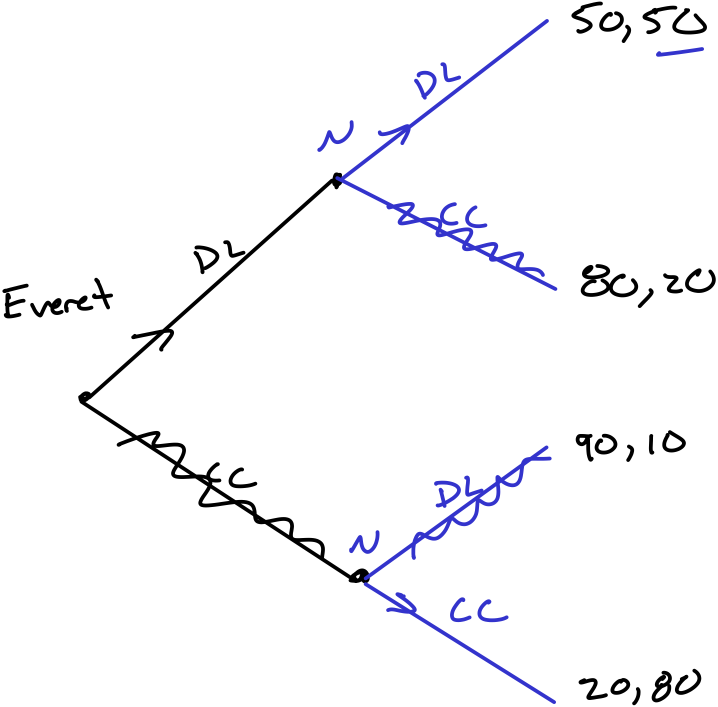


First-mover advantage

Example: Tennis (4.14)

Navritilova

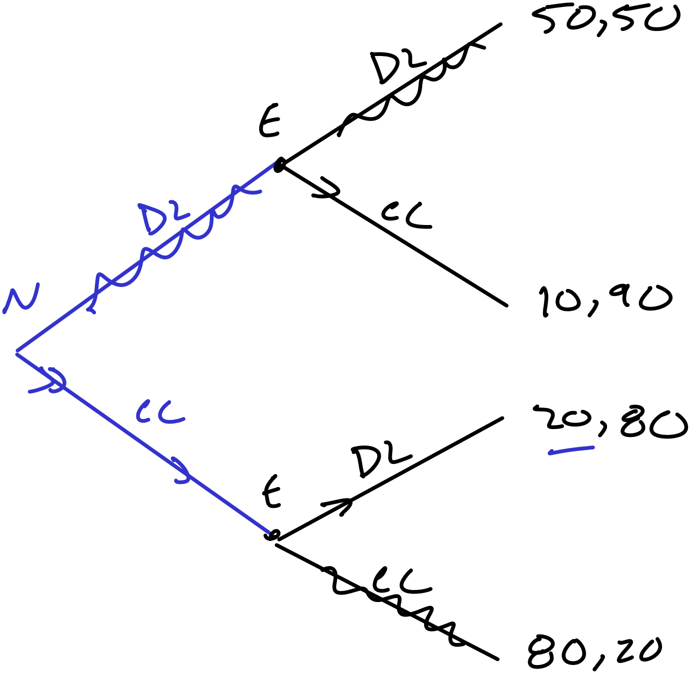
Everet		DL	CC
	DL	50,50	80,20
	CC	90,10	20,80



NE:

E: DL

N: (DL, cc)



NE:

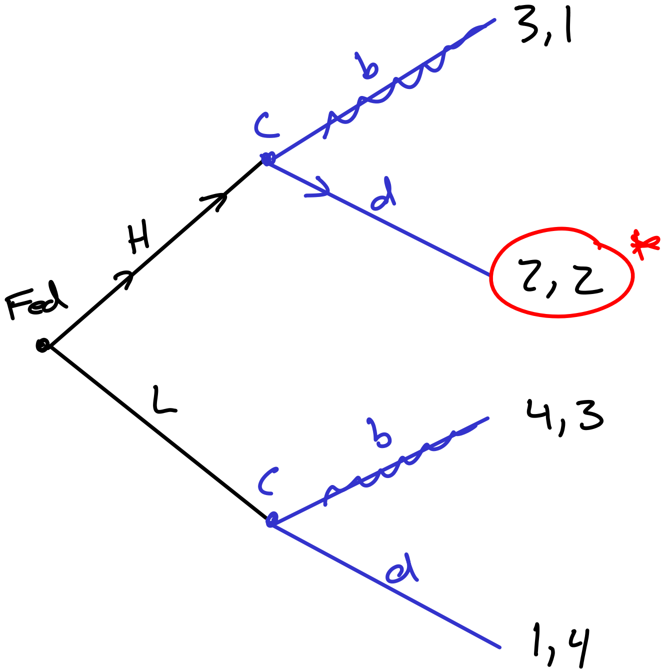
N: CC

E: CC, DL

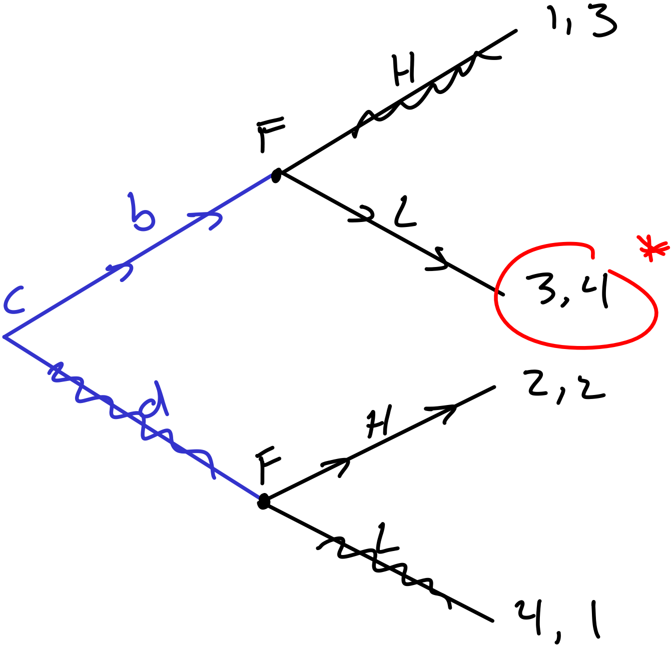
Second-mover advantage

Example: Monetary-Fiscal Policy Game (6.6a)

		Fed	
		Low interest rate	high interest rate
Congress	balanced budget	3, $\underline{4}$	1, 3
	deficit	$\underline{4}$, 1	$\underline{2}$, $\underline{2}$



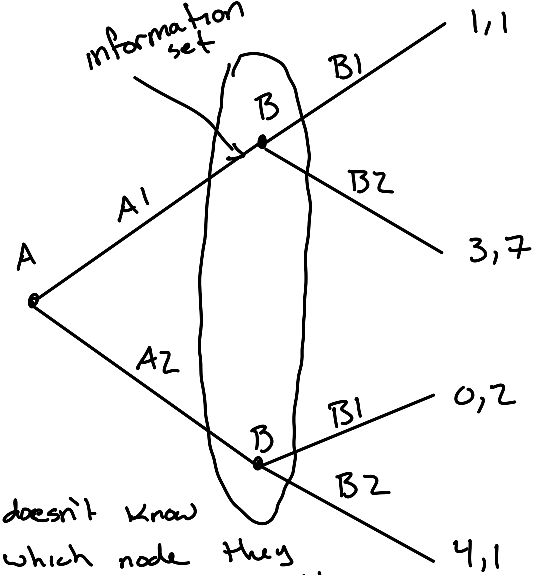
Fed
H
L
C
b
d
C
b
d
3, 1
2, 2
*
4, 3
1, 4



Both players are better off if c goes first

Expressing simultaneous games in extensive form

- Simultaneous-move games don't actually require players to move at the same time
  - Players are simply unaware of what other player chooses when they make their choice
- We can use *information sets* to describe this situation in simultaneous games
  - We draw a circle around nodes that are in the same information set
  - Players at a particular information set do not know which node they are at (within the set)



B doesn't know which node they are at when they move

Extensive form

Normal Form

B

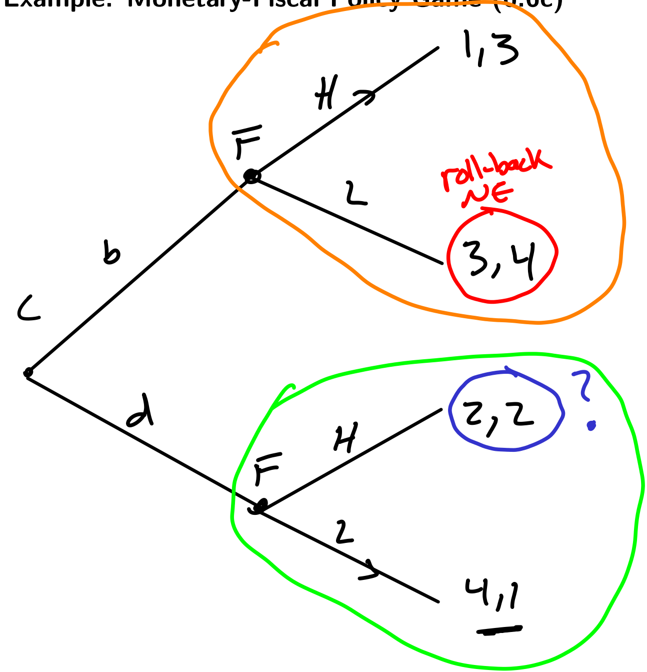
		B1	B2
A	A1	1,1	3,7
	A2	0,2	4,1

Example: Tennis (4.14)

Expressing sequential games in normal form

- Strategies are *complete plans of action*
- In a sequential game, this means we must describe the action of a player at *any possible node* where they might move
- This includes actions on *off equilibrium paths*

Example: Monetary-Fiscal Policy Game (6.6c)



Fed's Strategies

L if b, H if d

H if b, L if d

L if b, L if d

H if b, H if d

C : D

F : HH

not subgame NE strategy

Fed (b, d)

SPNE

		HH	LL	HL	LH
C	b	1, 3	3, 4	1, 3	3, 4 *
	d	2, 2 *	4, 1	4, 1	2, 2

not SPNE

Subgame Perfect NE (SPNE)

- Some NE are supported by *threats* of actions that may not be *credible* if the player is actually made to choose at that particular node
- We can describe the NE outcomes that don't require threats as SPNE
- A *subgame* is any possible "mini game" that results after any path of play
- The NE that are also NE for their respective subgames are SPNE