

Module 3: "Dynamic games of complete information"

Lecture 16: "Dynamic Games: Sequential Rationality"

The Lecture Contains:

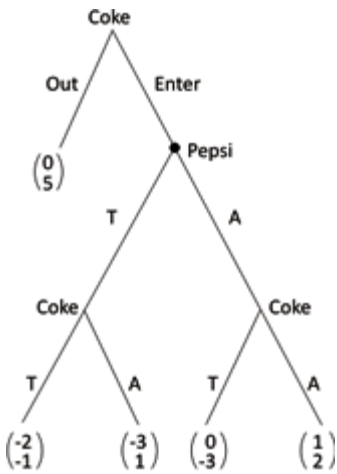
- Game II - Normal Form Version
- Game II: Unreasonable NE???
- Another Example - Any unreasonable NE???
- Sequential Rationality

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Dynamic Games: Different examples[Contd.]

Game II - Normal Form Version

	T	A
ETT	-2,-1	0,-3
ETA	-2,-1	1,2
EAT	-3,1	0,-3
EAA	-3,1	1,2
OTT	0,5	0,5
OTA	0,5	0,5
OAT	0,5	0,5
OAA	0,5	0,5



Coke's strategy (XYZ)

X- Coke's decision at 1st decision node

Y- Coke's decision at 2nd decision node (when Pepsi acts T)

Z- Coke's decision at 3rd decision node (when Pepsi acts A)

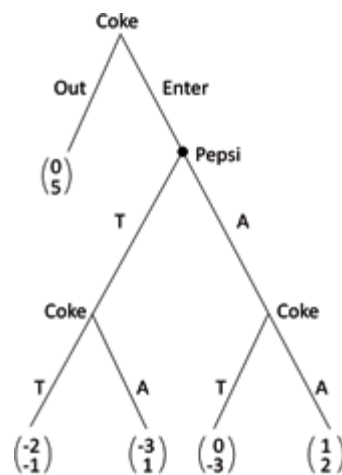
Check that following are the NE

[OTT, OTA, OAT and OAA; T,]

[ETA, A], [EAA, A]

Game II: Unreasonable NE???

- What are the unreasonable NE?



[EAA; A] is an unreasonable NE

- It shows that coke will choose A when Pepsi chooses T.

However from the game tree, it is clear that once this node is reached, coke is better off by choosing T then by A ($\because -2 > -3$)

Hence this is sequentially not rational

On similar grounds, (OAT, T) is another unreasonable equilibrium.

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Game II: Unreasonable NE???[contd.]

[OTT; T]- Unreasonable NE

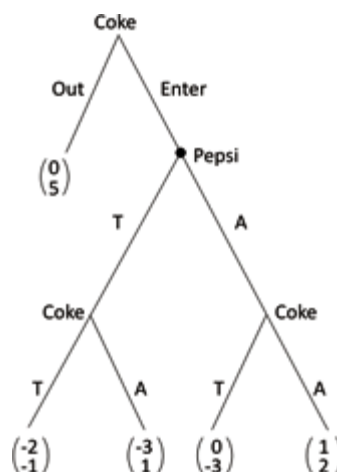
Here the strategy tells that coke will choose T when Pepsi chooses A.

But coke better off by choosing A then $[\because 1 > 0]$ - not sequentially rational

\therefore [OAT,T]: Another unreasonable NE [for similar reasons]

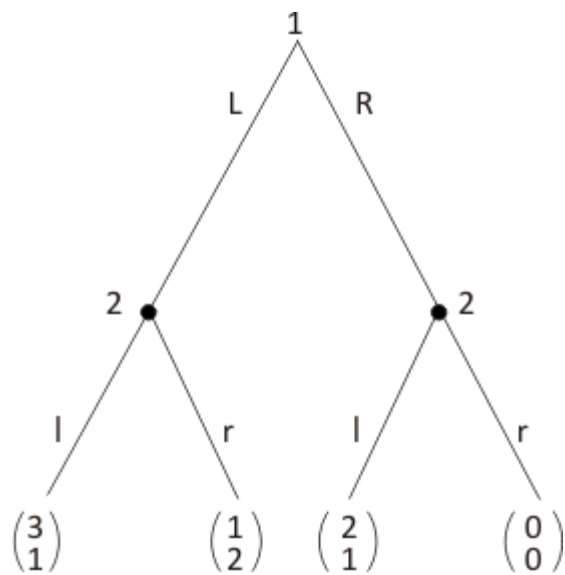
[OTA, T] : Not sequentially rational

Given the strategy OTA, Pepsi's best response is A and not T .



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Another Example



NFG representation of above game

		Player 2			
		(l l)	(l r)	(r l)	(r r)
Player 1	L	3, 1	3, 1	1, 2	1, 2
	R	2, 1	0, 0	2, 1	0, 0

NE

→ [R, (r,l)]

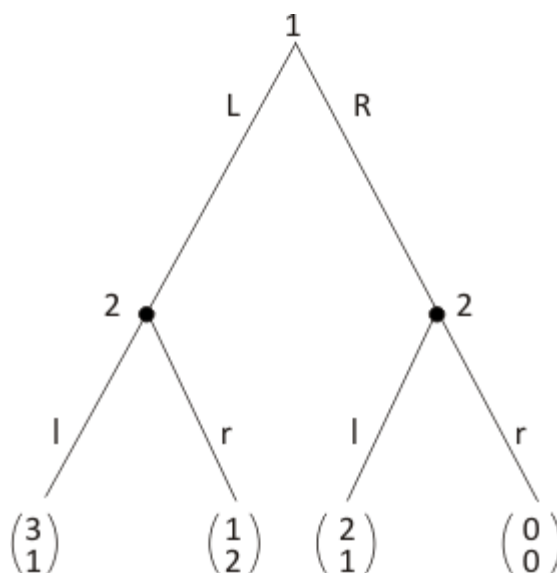
[L, (r,r)]

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Any unreasonable NE???

- Use the logic of sequential rationality
 $(L, (r, r))$ is not sequentially rational
- (r, r) means that player 2 plays r both when player 1 plays L & R
- Player 2 will never play r when player 1 plays R
- Player 2 is giving a threat to player 1 that if he plays R , player 2 will play r also
- This is a threat since player 1 will then get 0 by playing $R < \text{Payoff} = 1$ by playing L
- However threat is not credible
- Player 2 gets worse off by carrying out the threat and hence will never carry out threat
- $(L; (r, r))$ contains a non credible threat & hence is an unreasonable equilibrium.



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Sequential Rationality

Acceptable equilibrium among the set of Nash equilibrium are only those for which both the players are sequentially rational

- i.e. Players are choosing the optimal actions for every sequence of the game.

How to find the equilibria which are sequentially rational

- Use the method of backwards induction.

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