

Module 3: "Dynamic games of complete information"

Lecture 18: "Subgame perfect Nash Equilibrium (SPNE): Numerical Examples"

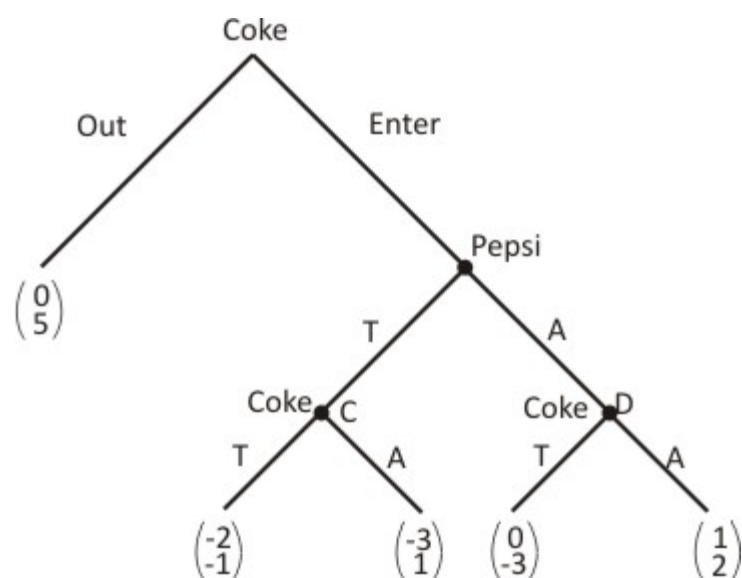
**The Lecture Contains:**

☰ SPNE:- Some other examples

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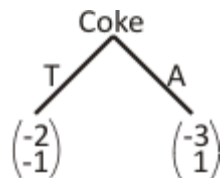
**SPNE:- Some other examples**

Entry Game II :



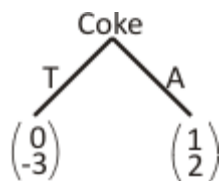
- Two smallest subgames at nodes C & D.

Subgame starting at C



Coke would choose T replace the node C with payoff  $\begin{pmatrix} -2 \\ -1 \end{pmatrix}$ .

Subgame obtaining at D.



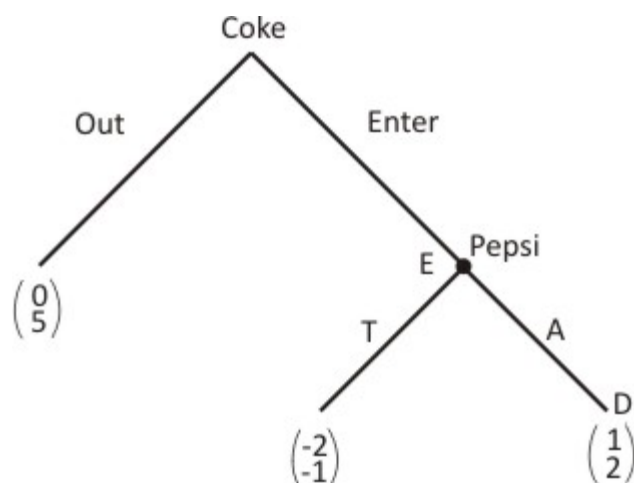
Coke chooses A

Replace the node at D with the payoff  $\begin{pmatrix} 1 \\ 2 \end{pmatrix}$

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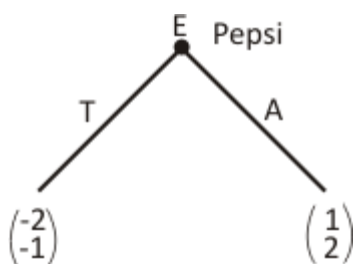
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The truncated game therefore is



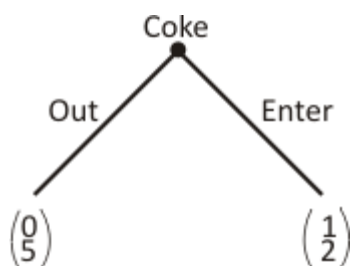
Smallest subgame now is at E.

Subgame starting at E.



Pepsi will choose A

Replace the node at E with payoff  $\begin{pmatrix} 1 \\ 2 \end{pmatrix}$



Coke will enter

SPNE:

$\left[ \text{Enter}, (\text{Tough if Tough}, \text{Accomodate if Accomodate}); \text{Accomodate} \right]$

$[ETA, A]$  is the SPNE

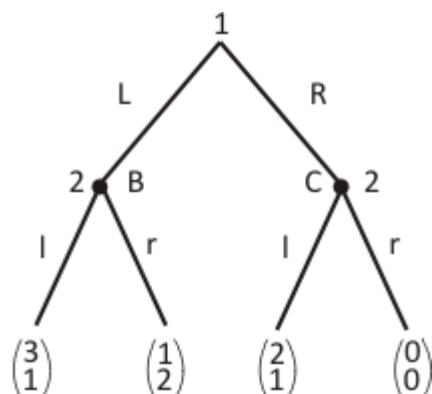
Check that there are six NE. [OTT, OTA, OAT & OAA, T]; (ETA, A); (EAA, A)

Out of these only one is SPNE; (ETA, A)

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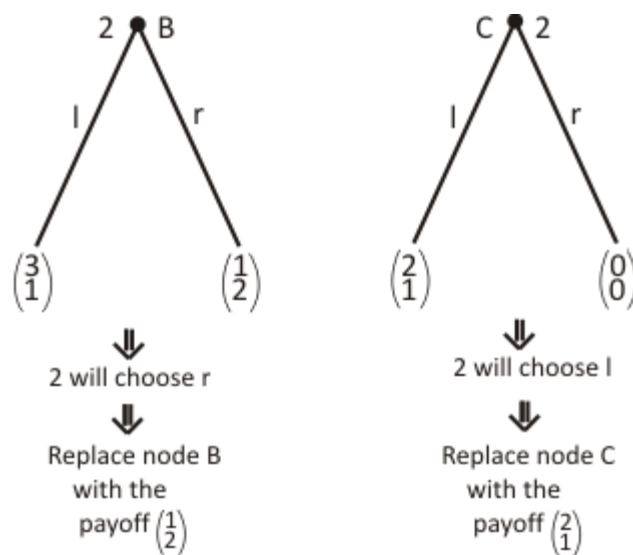
Another Example:



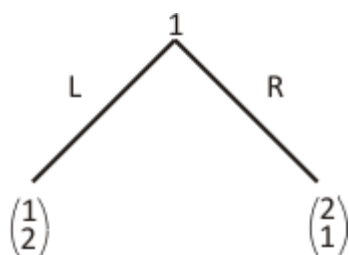
As found earlier here, there are 2 NE  $[L; rr]$   $[R; rl]$

Let's find out SPNE

Two subgame at B and at C

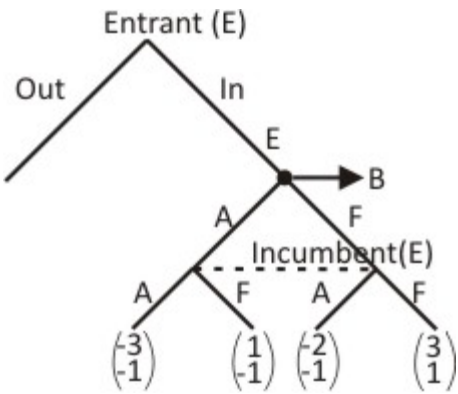


- Game reduces to

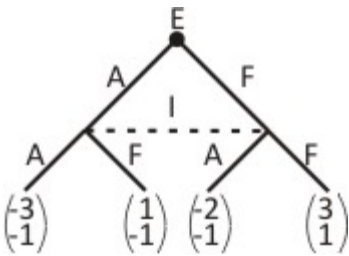


1 will choose R  
SPNE  $[R; rl]$

Another example



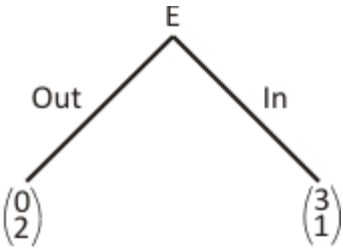
Game has only one subgame at B.



To solve the game, we write the normal form version of this game

		I		
		F	A	
E	F	(-3, -1)	(1, -1)	one NE (A, A)
	A	(-2, -1)	(3, 1)	

- Replace the node at B with payoff (3,1)
- Truncated some becomes



Entrant will choose In  
SPNE [(In, A if In); A]

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Nash Equilibrium of the whole game

**NFG version**

		Incumbent	
		A	F
Entrant	Out, F if In	0, 2	0, 2
	Out, A if In	0, 2	0, 2
	In, F if In	1, -1	-3, 1
	In, A if In	3, 1	-2, -1

Three NE for this game:

$[In, A \text{ if } In; A]$

$[Out, A \text{ if } In; F]$

$[Out, F \text{ if } In; F]$

- $[Out, A \text{ if } In; F]$  involves suboptimal behavior on part of I.
- given that in second stage if E plays A, it is suboptimal for I to play F, not sequentially rational.
- $[Out, F \text{ if } In; F]$  involves suboptimal behavior on part of entrant (E). In 2nd stage given that I plays F, it will be suboptimal for E to Play F - not sequentially rational.
- Hence SPNE rules out these two
- Only SPNE:  $[In, A \text{ if } In; A]$