Module 2: "Static games of complete information"

Lecture 6: "More on IEDS"

**The Lecture Contains:**

- Common Knowledge
- Odd Couples Example- What is the IEDS Solution?
- IEDS- A Case Study
- Drawback of IEDS

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**Common Knowledge**

Equilibrium obtained by IEDS depends on extended version of rationality

- Common Knowledge
  “Not only all the players are rational but also that all the players know that all the players are rational & that all the players know that all the players know that all the players are rational & so on add infinitum”.
- This extended version of rationality is the basic principle behind the method of IEDS

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**Odd Couples Example- What is the IEDS Solution?**

**Two roommates**

- Felix (F) and Oscar (O)

**Strategies**

- How many hours will they devote to cleaning their apartment
- Say they have a choice between 3, 6 or 9 hours to cleaning

**Rules:**

- It takes – at least 12 hrs of work to make the apartment clean
- 9 hours to make it livable
- Anything less than 9 hours makes the apartment dirty.
- Each person's utility from staying in a liveable apartment = 2
- Utility of clean apartment to Felix =10
- Utility of clean apartment to Oscar =5
- Disutility of a dirty apartment to Felix= -10
- Disutility of a dirty apartment to Oscar =-5

Payoff to each = Utility/ Disutility - Hours worked

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**Odd Couples Example – [Contd.]**

NFG representation

| | | O | | |
|---|---|---|---|---|
| | | 3 hrs | 6 hrs | 9 hrs |
| F | 3 hrs | -13, -8 | -1, -4 | 7, -4 |
| | 6 hrs | -4, -1 | 4, -1 | 4, -4 |
| | 9 hrs | 1, 2 | 1, -1 | 1, -4 |

IEDS outcome is [9hrs, 3hrs]

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**IEDS- A Case Study**

- Use a simple model to analyze the election of Secretary General to United Nations for the period [1997-2007]
- Three Candidates
  - Boutros – Ghali from Egypt (B)
  - Glo Harlem Brundtland from Norway (H)
  - Kofi Annan from Ghana (A)
- Two voters
  - United States (US)
  - Africa

Preferences

US: $H \succ A \succ B$

Africa: $B \succ A \succ H$

- Payoff = 1 if voter's best candidate is elected
  0 if voter's second best candidate is elected
  -1 if voter's third best candidate is elected

- Dynamic Game

US votes first and gets to veto (reject) one of the three Candidates-A, B or H
Then Africa vetoes (rejects) one of the two remaining candidates

- whoever is not vetoed (rejected) wins the election

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**IEDS Case Study [Contd.]**

US has 3 strategies to choose from A, B or H [whom to veto]

Africa has 3 components in a strategy – whom to veto if respectively A, B or H has already been vetoed

- 2 choices[2 remaining candidates] for each of its three components

**NFG representation:**

| | | Africa | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | HAA | HHA | HAB | AHB | BAA | BHA | BAB | BHB |
| US | A | -1, 1 | -1, 1 | -1, 1 | -1, 1 | 1,-1 | 1,-1 | 1,-1 | 1,-1 |
| | B | 1,-1 | 0, 0 | 0, 0 | 0, 0 | 1,-1 | 0, 0 | 1,-1 | 0, 0 |
| | H | -1, 1 | -1, 1 | -1, 1 | 0, 0 | -1, 1 | -1, 1 | 0, 0 | 0, 0 |

Africa - strategy (x, y, z)

x- whom will Africa veto if US vetoes A
y- whom will Africa veto if US vetoes B
z- whom will Africa veto if US vetoes H

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**IEDS- Case Study [Contd.]**

The strategy HHA dominates every other strategy [use of weak dominance]

- Hence eliminate all other strategies

| | | Africa HHA |
|---|---|---|
| US | A | -1, 1 |
| | B | 0, 0 |
| | H | -1, 1 |

- US vetoes B ; Equilibrium - (B,HHA)
  IEDS outcome → US vetoes B
  Africa follows by vetoing H
- A wins the election

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**Drawback of IEDS**

No result will be obtained when there does not exist any dominated strategy for any player in the beginning.

**eg.**

1. **Matching Pennies**

| | | Player 2 | |
|---|---|---|---|
| | | H | T |
| Player 1 | H | 1, -1 | -1, 1 |
| | T | -1, 1 | 1, -1 |

2. **Battle of Sexes**

| | | W | |
|---|---|---|---|
| | | B | M |
| A | B | 3, 2 | 1, -1 |
| | M | 0, 0 | 2, 3 |

- None of the players have any dominated strategy
- IEDS cannot predict about the play of game
- **FAILURE**

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