1. **Game Theory and Strategic Analysis**

- ✓ 11. Static Games and Nash Equilibrium
- ✓ 12. Imperfect Competition
- ✓ 13. Explicit and Implicit Cooperation
- ➤ 14. Strategic Commitment
  
  (a) Sequential games and backward induction.
  
  (b) How timing matters: Stackelberg games

2. **Sequential games and backwards induction**

  *Life must be understood backward, but … it must be lived forward.*

  – Soren Kierkegaard
Pirates puzzle

There are 5 pirates, named A, B, C, D, E. They are intelligent and greedy. They have 100 gold pieces to share. Here are the rules of distribution:

Pirate A proposes distribution of coins amongst the pirates. All pirates vote. If the majority vote against, then Pirate A is thrown to the sharks and Pirate B must propose a coin distribution. And so on.

Some details:

1. Each time, all remaining pirates vote, including the proposer.
2. In case of a tie, a proposal is accepted.
3. Assume that each pirate votes in favor of a proposal if and only if it gives a strictly higher payoff than what he/she gets if the proposal is defeated.

What happens?

Backward induction solution

1. First round:
   Pirate A proposes ...

2. If 2nd round is reached, Pirates B, C, D, E remain:
   Then Pirate B proposes ...

3. If 3rd round is reached, Pirates C, D, E remain:
   Then Pirate C proposes ...

4. If 4th round is reached, Pirates D and E remain:
   Then Pirate D proposes ...
An entry deterrence game

The figure below illustrates the following strategic situation involving Sony, which currently has a monopoly in the Discman, and JVC, which may enter the market.

Suppose Sony is making plans to build a new plant
Game Theory and Strategic Analysis

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⇒ 14. Strategic Commitment
✓ (a) Sequential games and backward induction.
⇒ (b) How timing matters: Stackelberg games

Pricing game from Session 12

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<th>Firm B</th>
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Suppose that Firm B can commit to its price first

\[
\begin{array}{c}
\text{Firm B} \\
\text{Low} & \text{Med} & \text{High} \\
\text{Firm A} & \text{Firm A} & \text{Firm A} \\
\text{Low} & \text{Med} & \text{High} \\
(19,20) & (24,23) & (18,25) & (40,27) & (22,38) & (34,42)
\end{array}
\]

Summary: What are Stackelberg games?

From these ingredients:

- two players: 1 and 2
- player 1 chooses action \( A_1 \) and player 2 chooses action \( A_2 \)

We can have three different strategic situations, depending on the timing:

- **Simultaneous moves**
- **Sequential game in which player 1 moves first**
- **Sequential game in which player 2 moves first**

Such sequential games are called **Stackelberg games**.

Player who moves first is the leader; other player is the follower.
11 Summary: What about Stackelberg games?

They let us see how timing and strategic commitment matter.

Who is behaving differently in Stackelberg vs. Nash?

Follower?

Leader?

12 Preemptive investments

Your firm is first to develop the next generation memory chip. You thus will be the first firm to install capacity. What are you thinking?
Wrap up on strategic commitment

When you have the chance to commit, think about:

1. In what way you want to influence the other players’ actions.

2. How you can achieve this.

Review (Tuesday) … Session 16 (Thursday)

No new material will be covered in either session!

The review session is optional; Session 16 is mandatory