Game Theory with Economic and Finance Applications

Magistère BFA 2 - Fall 2019

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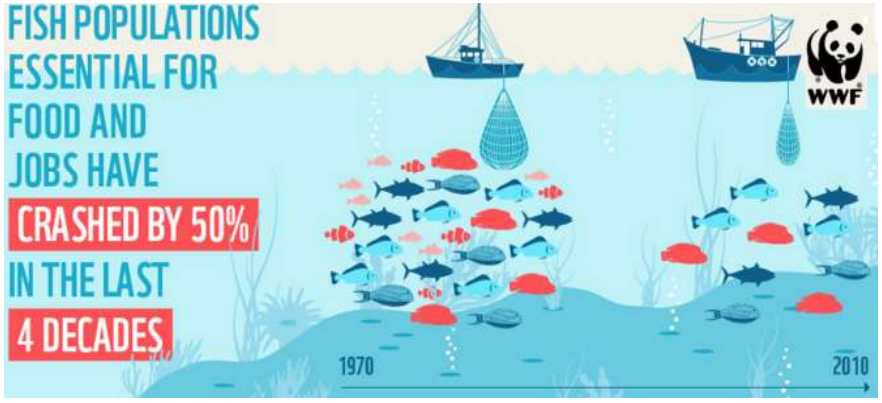
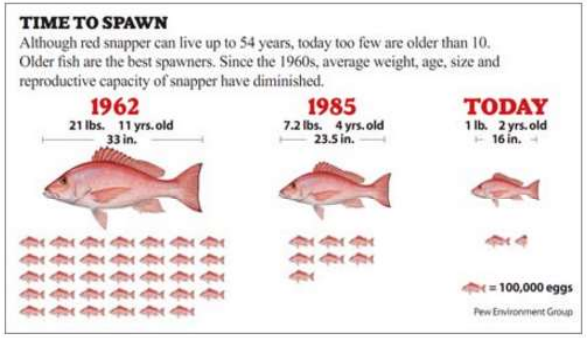
Introduction

Introduction
Outline

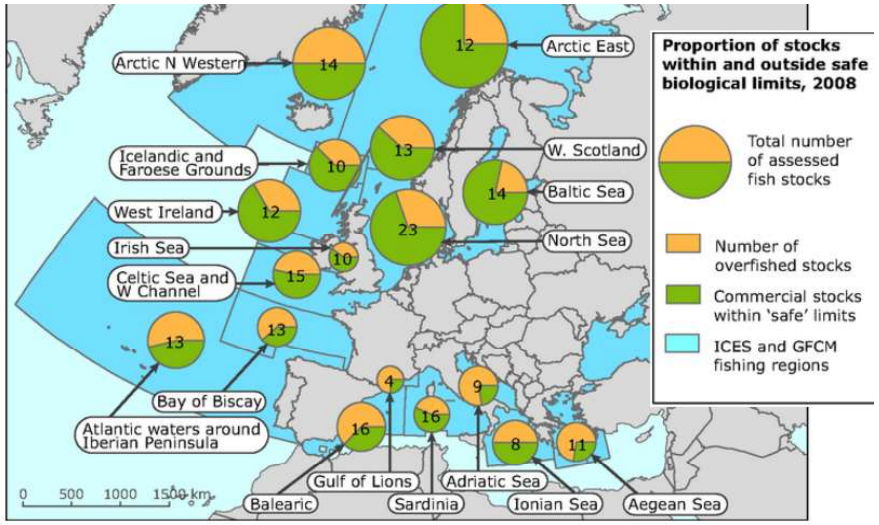
Regulation in Fisheries



Regulation in Fisheries



Regulation in Fisheries



Regulation in Fisheries

Solution

Thought #1: If we have too many fishermen, we need to limit the number of boats that can fish

Problem

Response #1: The remaining fishermen in the industry built bigger boats to catch the "extra" fish

Regulation in Fisheries

Solution

Thought #2: If they have too big of boats, we should limit vessel size

Problem

Response #2: Fishermen cut off the prow of their boats and loaded it with lots of crew

Regulation in Fisheries

Solution

Thought #3: If they have too many crew members, we should limit the crew size

Problem

Response #3: Fishermen loaded up their boats with tons of fishing gear

Regulation in Fisheries

Solution

Thought #4: This is getting ridiculous, we'll just close the season once a quota of fish have been caught

Problem

Response #4: Fishermen set out the first day of the season and catch and catch and catch... and seasons which used to end in 180 days ended in 2 days.

Regulation in Fisheries

Solution

Thought #5: Well, we'll just set days on which they can fish

Problem

Response #5: Fishermen buy enormous motors to "race for fish" creating a very dangerous "Fish Derby!"

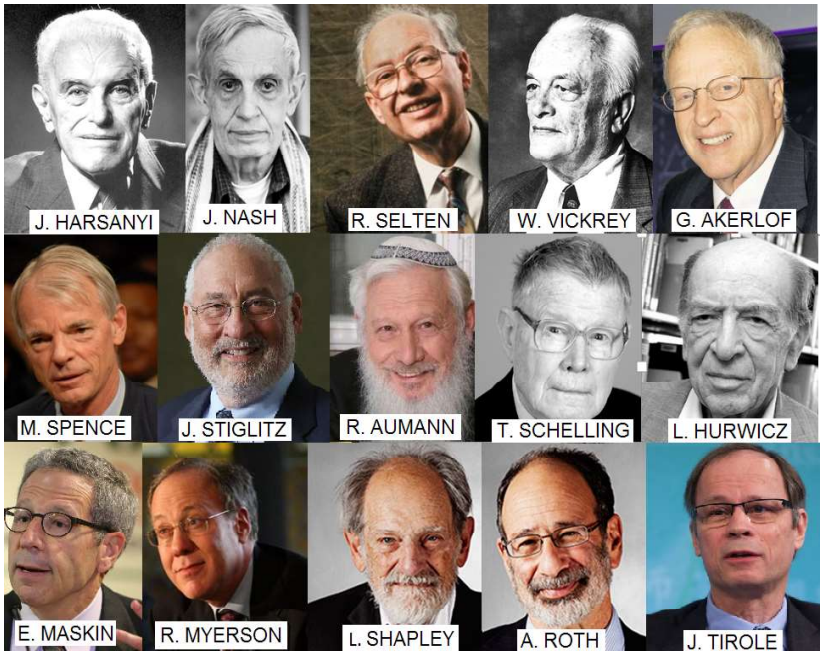
Regulation in Fisheries

Question

Why did all these regulatory measures fail?

Solution

*Because they ignore the **strategic interaction** so they just failed to account for the fundamental **incentives** driving fisherman behavior.*



Game theory

Set of tools to analyze strategic interactions. Applications in a great number of fields:

- Economics
- Finance
- Political science
- Biology
- Computer Science
- Philosophy

Game theory: predictive tool?

Set of tools that leads to predictions on behavior of players

Are the predictions generally correct?

We will often examine lab evidence

Beauty contest
Rules of the game

1. All take a piece of paper, write your name
2. Write a number between 0 and 100
3. The student whose number is the closest to half the average is the winner
4. If tie between several students, random draw
5. Cannot discuss with others or look at their piece of paper....

Beauty contest
Results

- Result of the first round:
  - Average:
  - Half the average:
  - Winner:
- Result of the second round:
  - Average:
  - Half the average:
  - Winner:
- Result of the third round:
  - Average:
  - Half the average:
  - Winner:

Beauty contest
Interesting questions

- Are players rational?
- What does “rationality” imply in this game?
- How should a rational player behave in a population in which not everyone is perfectly rational?

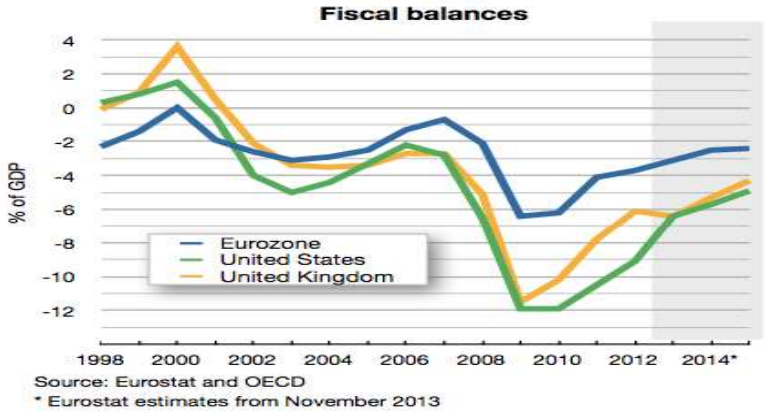
Beauty contest
Pictures

Beauty contest
Pictures

Beauty contest
Market self-fulfilling prophecy: European sovereign-debt crisis

- A **self-fulfilling prophecy** is a prediction that causes itself to become true, by the very terms of the prophecy itself, due to positive feedback between belief and behavior.
- European sovereign-debt crisis:
  - The debt levels of European countries kept rising since 2007, mostly due to the large bailout packages provided to the financial sector during the late-2000s financial crisis.
  - However, high debt levels alone may not explain the crisis.
  - The budget deficit for the euro area as a whole is much lower and the euro area's government debt/GDP ratio of 86% in 2010 was about the same level as that of the US.

Beauty contest
Market self-fulfilling prophecy: European sovereign-debt crisis



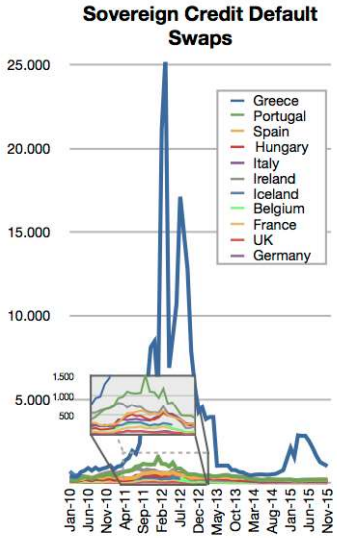
Fiscal balance = tax revenue (and the proceeds of assets sold) − government spending.

When the balance is positive (resp. negative), the government has a fiscal surplus (resp. deficit).

Beauty contest
Market self-fulfilling prophecy: European sovereign-debt crisis

- Banks had substantial holdings of bonds from economies such as Greece which offered a small premium and seemingly were equally sound.
- As the crisis developed it became obvious that Greek, and possibly other countries', bonds offered substantially more risk.
- The loss of confidence is marked by rising sovereign CDS prices, indicating market expectations about countries' creditworthiness.
- Next figure: Sovereign CDS prices of selected European countries (2010–2011).
  - The left axis is in basis points. E.g., a level of 1,000 means it costs $1 million to protect $10 million of debt for five years.

Beauty contest
Market self-fulfilling prophecy: European sovereign-debt crisis



Beauty contest
Market self-fulfilling prophecy: European sovereign-debt crisis

- Beginning in early 2010, renewed anxiety about excessive national debt of investors demanded ever higher interest rates from several government with higher debt levels, deficits and current account deficits.
- This in turn made it difficult for some governments to finance further budget deficits and service existing debt, particularly when economic growth rates were low, as in the case of Greece and Portugal.
- The loss of confidence and the consequent government behaviors can be explained by the self-fulfilling mechanism.

Introduction
Outline

Describing games

In general, a game is defined by:

1. Set of players
2. Set of choices for these players
3. Payoff function depending on choices

Major differences between games

Certain dimensions will help us categorize and study games:

1. Timing of the game:
   - Do the players play at the same time (*simultaneous games*)?
   - Or do they observe other players moves and then decide (*sequential games*)?
2. Is the game played once or is it repeated several times?
3. Do all the players have the same information?
   - Can imagine that players have better information about some payoff of the game.

Outline of the course

1. Introduction and Chapter 1: Simultaneous games ($c_1 \& \frac{c_2}{2}$)
2. Chapter 2: Sequential games ($\frac{c_2}{2} \& c_3$)
3. Chapter 3: Repeated games ($c_4 \& \frac{c_5}{2}$)
4. Chapter 4: Incomplete information games ($\frac{c_5}{2} \& c_6$)

Contact and Evaluation

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Course assessment: final exam