Microeconomic Analyses of Old Indian Texts
Backward induction

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Course overview

Part B. Game theory

- Chapter VI:
  Noncooperative games
- **Chapter VII:**
  Backward induction
- Chapter VIII:
  Ordeals
- Chapter IX:
  Judicial wagers
- Chapter X:
  Indian Principal-Agent Theory
- Chapter XI:
  The mandala theory

Chapter VII: Backward induction

1. Game tree and backward induction
2. Indian fables
3. Additional exercises
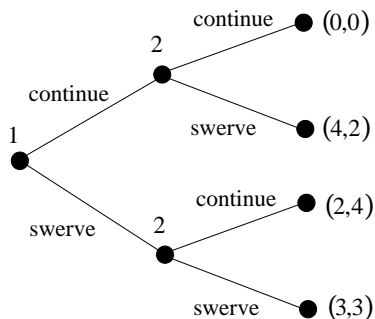
Game tree and backward induction
Definition

- so far: strategic or simultaneous-form games
- now: game tree
  - player 1 moves first
  - player 2 learns player 1's move and then moves himself

Game of chicken:
It it advantageous to move first?

Game tree and backward induction
Game of chicken I

Player 2 knows what player 1 has done.
Player 1 can predict the reaction of player 2

Problem
What is your prediction?
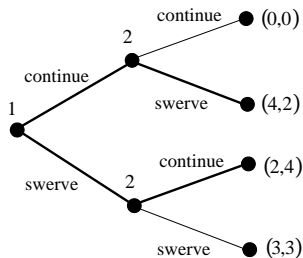
Game tree and backward induction
Game of chicken II

Problem
Find the backward-induction solution for the game of chicken!
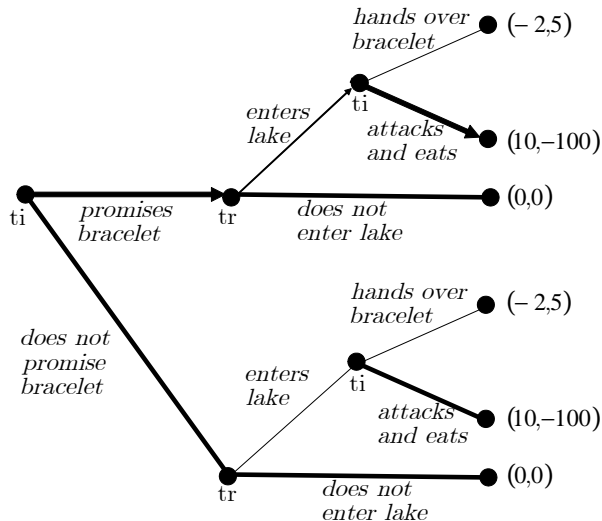
Solution
Driver 1 has a first-mover advantage in the game of chicken. He chooses "continue" so that driver 2 is forced to swerve.
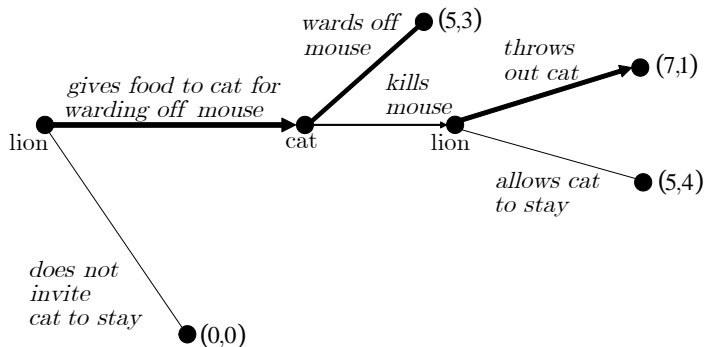

Problem
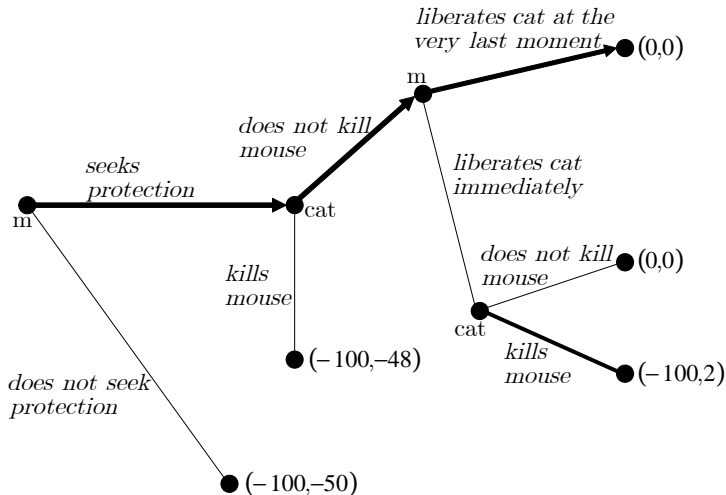*How about "matching pennies" or the "battle of the sexes"?*

Indian Fables: The tiger and the traveller

Indian Fables: The lion, the mouse, and the cat

Indian Fables: The cat and the mouse

liberates cat at the very last moment (0,0)

m

does not kill mouse

seeks protection

m

cat

liberates cat immediately

kills mouse

(−100,−48)

does not kill mouse (0,0)

cat

kills mouse

(−100,2)

does not seek protection

(−100,−50)

Additional exercise

In the centipede game, the players choose b (to finish) or w (to go on) in turn:

- What would you do if you were player 1?
- Solve this game by backward induction!
- Do you want to reconsider your answer to the first question?