Economics 3012
Strategic Behavior
Andy McLennan
July 28, 2006

My contact info:

- 341 Merewether, 9351-6607
- Office hours: 2:30-3:30 Tuesday
- a.mclennan@econ.usyd.edu.au
- http://www.econ.umn.edu/~mclennan

Books:

- *An Introduction to Game Theory* by Martin Osborne is the required text.
- Other useful texts are listed in the Unit of Study Outline
Assessments:

- Online Quizzes on Blackboard related to Problem Sets: 15%.

  The quiz will be available during the final two days prior to the next class. You should do the problem set first, then log in to Blackboard to do the associated quiz. After you log in to the quiz, you have only one chance to do it, so you must complete it then.

- Midterm: 30%. (What would be a good date?)

- Final: 55%.
What is Game Theory?

- Game theory analyzes social environments in which *rational* individuals interact *directly*.
  - Here ”rational” means, in effect, that we assume that agents’ goals are coherent, and take them as given.
  - ”Directly” is in contrast with competitive markets, in which each individual is affected only by the price, and no individual has a nonnegligible influence on the price.

- There will be a mathematical description of the environment including:
  - Agents or players.
  - For each agent, a set of strategies.
  - For each agent, a payoff function.

- Predictions are derived by applying a *solution concept* to the game.
History of Game Theory

• Daniel Bernoulli (1738) - distinction between wealth and utility.

• Ernst Zermelo (1912) - first mathematical paper studying optimal play in a game.

• John von Neumann (1903-1957):
  – Minimax theorem for zero sum games. (1928)
  – (with Oscar Morgenstern) *Theory of Games and Economic Behavior*. (1944)

• John Nash (1928 - ) - the concept of Nash equilibrium.

• Nobel Prize winning game theorists:
  – John Nash.
  – John Harsanyi.
  – Reinhardt Selten.
  – Robert Aumann.
Application Areas of Game Theory

• Application areas in economics:
  – Imperfect competition.
  – Bargaining.
  – International trade.
  – Auctions.
  – Mechanism design.

• Other disciplines currently applying game theory:
  – Political science.
  – International relations/military strategy.
  – Psychology.
  – Evolutionary biology.
  – Computer science.
Normal Form Games: the General Model

- The agents or players are the integers 1, \ldots, n. Let I = \{1, \ldots, n\}.
  - Sometimes one considers models with infinitely many agents, but not so much in this course.
- For each \(i \in I\), \(S_i\) is a set of pure strategies.
  - Usually \(S_i\) is finite, but we will also consider games for which \(S_i\) is a closed bounded interval \([a, b] = \{ \ t: a \leq t \leq b \ \}\).
  - \(S = S_1 \times \cdots \times S_n\) is the set of pure strategy profiles.
- For each \(i \in I\), \(u_i : S \rightarrow \mathbb{R}_i\) is a payoff or utility function.
- **How the game is played:** each agent \(i\) has to choose an \(s_i \in S_i\) before learning what strategies the other agents chose. Agent \(i\) receives the payoff \(u_i(s)\) where \(s = (s_1, \ldots, s_n)\) is the profile of pure strategies that was chosen.