Overview and Philosophy of Science

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- Course
  - Title: Advanced Microeconomics
  - Target students: Graduate Students in the Economics and Finance Departments
  - Language of instruction: English + Chinese
  - Class website: http://benjaminchiao.org/classes/PKU/09b/fall09advmicro.htm
  - All students should sign up on Blackboard: http:.//course.pku.edu.cn
- Instructor: Benjamin CHIAO
  - benjamin.chiao@gmail.com Please resend your message if you have not received a response within 48 hours.
  - Office: Room 302, New Guanghua Building
  - Office hours: Friday 12-1. Please make an appointment one day in advance.
- TA: CHEN Zhe chenzhe1@gsm.pku.edu.cn and SUN Ning sunning@gsm.pku.edu.cn

- Texts
  - (Required) 1. Mas-Colell, A., Whinston, M. D., and Green, J. R. (1995). Microeconomic Theory. Oxford: Oxford University Press.
  - (Optional) 2. Varian, H. R. (1992). Microeconomic Analysis, Third Edition. New York: W. W. Norton & Company.

- Format
  - Weekly lectures by the professor and two weekly lab sessions by the teaching assistants. Students are free to choose to go to one of the lab sessions in a given week.
- Shadow Class
  - Students with a weaker economic or mathematical background are encouraged to sit in the easier version of this class I am teaching for non-economics oriented students. Some lectures between the two classes are identical.

- Mailing List
  - You must subscribe to ONE mailing list within 12 hours of the first class to subscribe to the class mailing list to receive announcements.
    - If you were born on an even date (e.g. Oct 2, Jan 4), you are in discussion group A. Else, it is B. If you are in discussion group A, you must use your PKU email address to send a blank email to chiao2009groupA-subscribe@yahoogroups.com to subscribe to the list. Else, send it to chiao2009groupB-subscribe@yahoogroups.com. The corresponding addresses for postings are chiao2009groupA@yahoogroups.com and chiao2009groupB@yahoogroups.com
- Other Details
  - Read the most updated syllabus on the class website carefully

- More details on evaluation later

About this Course
What is Microeconomics
The Philosophy of Science and Economics
Evaluation

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What research questions have you heard in economics?

Why use economics? Why don't we use astrology?

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- Science v. Pseudo-Science

Science v. Pseudo-Science

- Verification Criterion
  - Scientific theories can be verified with empirical evidence
  - Popper's Critique: too loose, many bad theories can be verified this way.
- Karl Popper's Falisificationist Criterion
  - A scientific theory can be (has a possibility of being) refuted by empirical evidence

Exercise

- What are the sensible criteria for choosing which telescopes to use to confirm that a newly discovered star is really red as some theorists have predicted?

- Philip Kitcher's Critique of the Falsificationist Criterion
  - If theories need to be falsifiable in isolation, too restrictive: nothing can be falsified
  - If theories need to be falsifiable with some auxiliary hypotheses, too loose: anything can not be falsified

- So perhaps one way is to assume a set of auxiliary hypotheses that is true
- Then if the conclusion is false, we can conclude that the theory is wrong

- How do we choose which set of auxiliary hypotheses to assume to be true?

The most well known assumption in economics

- "It is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own interest ..."
  - Smith (1776), *The Wealth of Nations*

- The Two Faces of Adam Smith

The Two Faces of Adam Smith

- "It is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own interest ..."
  - Smith (1776), *The Wealth of Nations*
- "How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it except the pleasure of seeing it."
  - Smith (1766), *The Theory of Moral Sentiments*

Interpreting The Two Faces of Adam Smith

- Men are selfish
  - Smith (1776), *The Wealth of Nations*
- Men are altruistic
  - Smith (1766), *The Theory of Moral Sentiments*

- A false assumption does not imply that the conclusions are wrong
  - Ernest Nagel, "Assumptions in Economic Theory," American Economic Review, May 1963.
- Assumptions can be further justified by evolution. If firms are not maximizing profits (the max is zero by the way), they die out in the long run.
  - Armen Alchian, "Uncertainty, Evolution and Economic Theory," Journal of Political Economy, June 1950.

- How can we evaluate theories?

Positive Economics/Science

- Merits of economic theories are from their explanatory (or predictive) power
  - Milton Friedman, "The Methodology of Positive Economics," Essays in Positive Economics (Chicago, 1953).
- "The surpreme value of a new theory is its power to predict new empirical laws" R. Carnap.
  - R. Carnap (1966). *An Introduction to the Philosophy of Science*.
  - More on this method later

Progress of Science

- Kuhn (1962). *The Structure of Scientific Revolutions*.
  - science does not progress via a linear accumulation of new knowledge, but undergoes abrupt periodic revolutions, also called "paradigm shifts"
  - science is broken up into three distinct stages.
    - Prescience: lacks a central paradigm, comes first.
    - Normal science: scientists attempt to enlarge the central paradigm by "puzzle-solving". Thus, the failure of a result to conform to the paradigm is seen not as refuting the paradigm, but as the mistake of the researcher.
    - Revolutionary science: As anomalous results build up, science reaches a crisis, at which point a new paradigm, which subsumes the old results along with the anomalous results into one framework, is accepted.
- What are the relationships between paradigms and auxiliary assumptions?

What are Empirical Evidence/Truths/Knowledge?

- Competing epistemologies (the study of how we know things) in philosophy
  - Rationalism holds that a priori truths will become evident for human beings when properly equipped. E.g. Plato, Leibniz, etc.
  - Kantism holds that a priori truths exist but are seen only because of the ways our brains are structured. E.g. Chomsky asserted that human beings are born with a universal grammar
  - Empiricism holds that knowledge is relative, the only knowledge that human beings acquire is from sensory experience. E.g. Locke, Berkeley, Hume. Locke asserted that babies are tabula rasa (empty boxes) that are gradually filled with experiences. And also on the primary/secondary quality distinction

- Primary/Secondary Quality Distinction
  - John Locke in his *Essay Concerning Human Understanding*, but earlier thinkers such as Galileo and Descartes made similar distinctions. Locke: Is the water warm?
  - Primary qualities (number and figure) are measurable aspects of physical reality. Secondary qualities (color, taste, smell, and sound) are subjective.
  - Critics: George Berkeley maintains that the ideas created by sensations are all that people can know for sure. Individuals cannot think or talk about an object's being, but rather think or talk about an object's being perceived by someone. As a result, what is perceived as real or true consists only of ideas in the mind.

- Back to evaluation method...what are empirical laws?
  - "The surpreme value of a new theory is its power to predict new empirical laws" R. Carnap.
    - This and the following quotes are from R. Carnap (1966). *An Introduction to the Philosophy of Science*. Dover Publications. Chs 23-26.

- A Digression on "Theoretical Laws and Empirical Laws"

- "Empirical laws, in my terminology, are laws containing terms directly observable by the senses or measurable by relatively simple techniques."
- "There is no commonly accepted term for [theoretical laws]...They are laws about such [nonobservables] such as molecules, atoms, ...that cannot be measured in simple, direct ways."

- “Philosophers and scientists have quite different ways of using the terms “observable” and “nonobservable...To a philosopher, [the properties of] “observable”, [such as blue, hard, hot], are directly perceived by the senses. To a physicist, [temperature and weights] are observables because they can be measured in an extremely simple ways.”

- What do you think should be considered as observables and nonobservables in economics?

- "A scientist does not start with one empirical law, perhaps Boyle's law for gases, and then seek a theory about molecules from which this law can be derived. The scientist tries to formulate a much more general theory from which a variety of empirical laws can be derived. The more such laws, the greater their variety and apparent lack of connection with one another, the stronger will be the theory that explains them."

- "Every confirmation of a law, empirical or theoretical, is, of course, only partial, never complete and absolute. But in the case of empirical laws, it is a more direct confirmation. The confirmation of a theoretical law is indirect, because it takes place only through the confirmation of empiricial laws derived from the theory."

- However, “the statement that empiricial laws are derived from the theoretical laws is an oversimplication.”
- “It is not possible to derive them directly because a theoretical law contains theoretical terms, whereas an empirical law contains only observable terms”

- To allow direct deduction of an empirical law from a theoretical law, we need "a set of rules connecting the theoretical terms with the observable terms".
- These rules are called correspondence rules, dictionary, operational rules/definitions (auxilliary hypotheses?)

- "There is a temptation at times to think that the set of rules provides a means for defining theoretical terms, whereas just the opposite is really true."
- For example, consider two questions:
  - What is iron?
  - What is an electron?

- What is iron?
  - iron can be defined as a substance consisting of small crystalline parts, each having a certain arrangement of atoms and each atom being a configuration of particles of a certain type
- Using such theoretical terms of atoms, it is then possible to express the observable term iron into theoretical terms

- What is an electron?
  - A physicist has to relate it with theoretical concepts such as electricity, magnetism, gravity, molecules and the like.
- It is then hard, if not impossible, to express the theoretical term electron into observable terms

- How can the empirical meaning of a theoretical term be determined?

- Frank Ramsey, a Cambridge logician and economist, before he died at 26. Wrote an incomplete volume *The Foundations of Mathematics,* which Carnap said it "deserves much more recognition than it has received."
- He proposed that the combined system of theoretical and correspondence postulates of a theory be replaced by what is today called the "Ramsey sentence of the theory".
- In such sentence, which is equivalent to the theory's postulates, theoretical terms do not occur at all.

- Suppose a theory contains n theoretical terms: $T_1, T_2, ..., T_n$.
- These terms are introduced by the theory's postulates
- They are then connected by the theory's correspondence rules
- These rules contain m observational terms: $O_1, O_2, ..., O_m$.
- A full statement of the theory contains all these m + n terms.
- Ramsey proposed that all the T terms be replaced by U terms, the corresponding variables. And then we add the "existential quantifiers" to this U terms: $(\exists U_1)$, $(\exists U_2)$,....,$(\exists U_n)$. This is called the Ramsey sentence.

Example (Source: http://www.jimpryor.net/teaching/courses/mind/notes/ramseylewis.html

- Theory: Car Theory: ...and **the carburetor** mixes *gasoline* and *air* and sends the mixture to **the ignition chamber**, which in turn...and that *makes the wheels turn*.
- The **bold** terms are names for parts of the car, with which our audience may not be familiar. The *italicized* terms are names for things and phenomena we'll suppose our audience already understands.
- Ramsey-sentence: $\exists x_1 \exists x_2$ (...and x_1 mixes gasoline and air and sends the mixture to x_2, which in turn...and that makes the wheels turn.)

- Next, we can define what it is to be a carburetor and an ignition chamber as follows:
  - A carburetor = an x_1 such that x_2 (...and x_1 mixes gasoline and air and sends the mixture to x_2, which in turn...and that makes the wheels turn.)
  - An ignition chamber = an x_2 such that x_1 (...and x_1 mixes gasoline and air and sends the mixture to x_2, which in turn...and that makes the wheels turn.)
- In this way, we explain what a carburetor is, in terms of how it interacts with ignition chambers and with other things, without presupposing that our audience already knows what an ignition chamber is.

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- Evaluation
  - A% Mid-term exam
  - B% In-class cumulative final exam (emphasis will be put on the materials after the mid-term)
  - 20% Weekly homeworks (hand in two sets of homework as a group in the beginning of each lecture. You are allowed to form a group of 6 or 7 students. Email both teaching assistants within 12 hours of the first class if you would rather be assigned into a random group by the professor. The score for the lowest scoring homework will not be counted. All group members receive the same grade)
  - 4%+4% Two group presentations in lab sessions
  - 10% Group debates (they will take place during the last lecture. Each debate is 20 minutes long. Topics to be announced. All group members receive the same grade)
  - 8% Online discussions
  - 2% Your name/identification clearly written in your works and email communication
  - 2% Peer Review Each student is required to evaluate all of his or her group members for contributions to the group
- The sum is 50%+Max(A,B)*30%+Min(A,B)*20%.

- A 5% maximum will be given for exceptional creativity (almost all students will get zero).
- Group oral exams (each group member could be asked and your group members are allowed, with no deduction in scores to the examinee, to help if requested by the examinee. Only a letter score from A to F will be given. The score will not be counted towards the final score but will be considered for future purposes such as recommendation for graduate schools or employment. All group members receive the same grade)
- You receive a fail with no exceptions for cheating. If you know some people are cheating and you do not report it, you will be penalized on a case-by-case basis.

Please fill out this questionnaire

- What's your expectation of this course?
- What's your expectation of the instructor?
- What's your expectation of the TA?
- What's your academic background?
- What topics do you want to see?
- What are the most advanced mathematics courses you have taken?
- Have you studied intermediate microeconomics?
- If you are a masters student, will you go for a PhD?