Econometrics 1

Lecture 1: Introduction

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Course Information

The purpose of this course

- Learn introductory econometrics

  Basic theories (models) and how to apply them.

- Learn how to use *gretl*

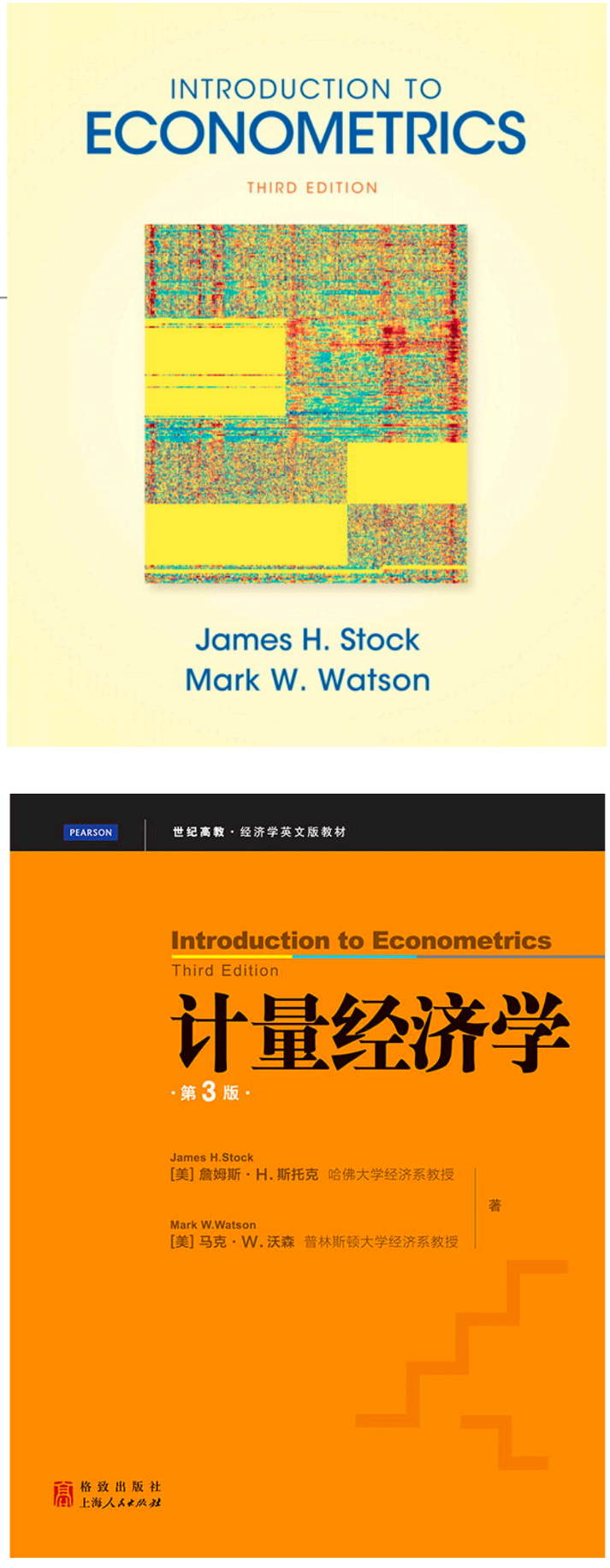
- Develop your ability of understanding, criticizing, and conducting econometric studies

The contents of this course

- How to use gretl
- Review of probability & statistics
- Estimation
- Hypothesis testing
- Linear regression
  one regressor
  multiple regressor
- Nonlinear regression
- Panel data
- Binary dependent variables
- Instrumental variables

Textbook

- Stock & Watson,
  Introduction to Econometrics, 3rd,
  Pearson, 2011.



- 《计量经济学：第三版》英文版，
  斯托克、沃森著，
  格致出版社，2013.
  ISBN: 978-7-5432-2227-4

Grading

- Grading
  - Assignments 3 × 10%
  - Reading report 20%
  - Final exam 50%
- Course website

  `http://huangjp.com/teaching/econometrics.html`

For each class

- 1st session

  focus on theory

- 2nd session

  focus on practice (with gretl)

- 3rd session

  exercise

Introduction

What you are supposed to do here

- You have three years, longer than almost all foreign graduate students
- First year:
  - Study
- Second and third year:
  - Conduct research (scientific or political)
  - Write papers/reports (and/or get published)
  - Finish your dissertation

Critical thinking

- “创造性从哪里来？我认为有三个基本元素，那就是好奇心、想象力和批判性思维。”

- “批判性思维就是善于对被广泛接受的结论提出疑问和挑战，而不是无条件地接受专家和权威的意见。同时，批判性思维又不是对一切命题都否定， 而使用分析性、创造性、建设性的方式对疑问和挑战提出新解释，做出新判断。”

—— 钱颖一、《大学的改革 第一卷·学校篇》、中信出版社、2016

What is economics?

Typical economic problems

- There are three questions that any society has to face:
  - What goods and services should be produced?
  - How should these goods and services be produced?
  - Who should get the goods and services that have been produced?

Economics

- Resources are scarce, therefore people have to make choices.

- **Economics** is the study of how society manages its scarce resources and attempts to answer the three key questions.

- Economists are interested in:
  - How people make decisions
  - How people interact with one another
  - How the economy as a whole works

Faces of economics

- The economist as scientist
  - They devise theories, collect data, and then analyze these data in an attempt to verify or refute their theories.
- The economist as policy advisor
  - Advises may or may not be based on scientific analysis.

Economist as scientist

- Empiricism

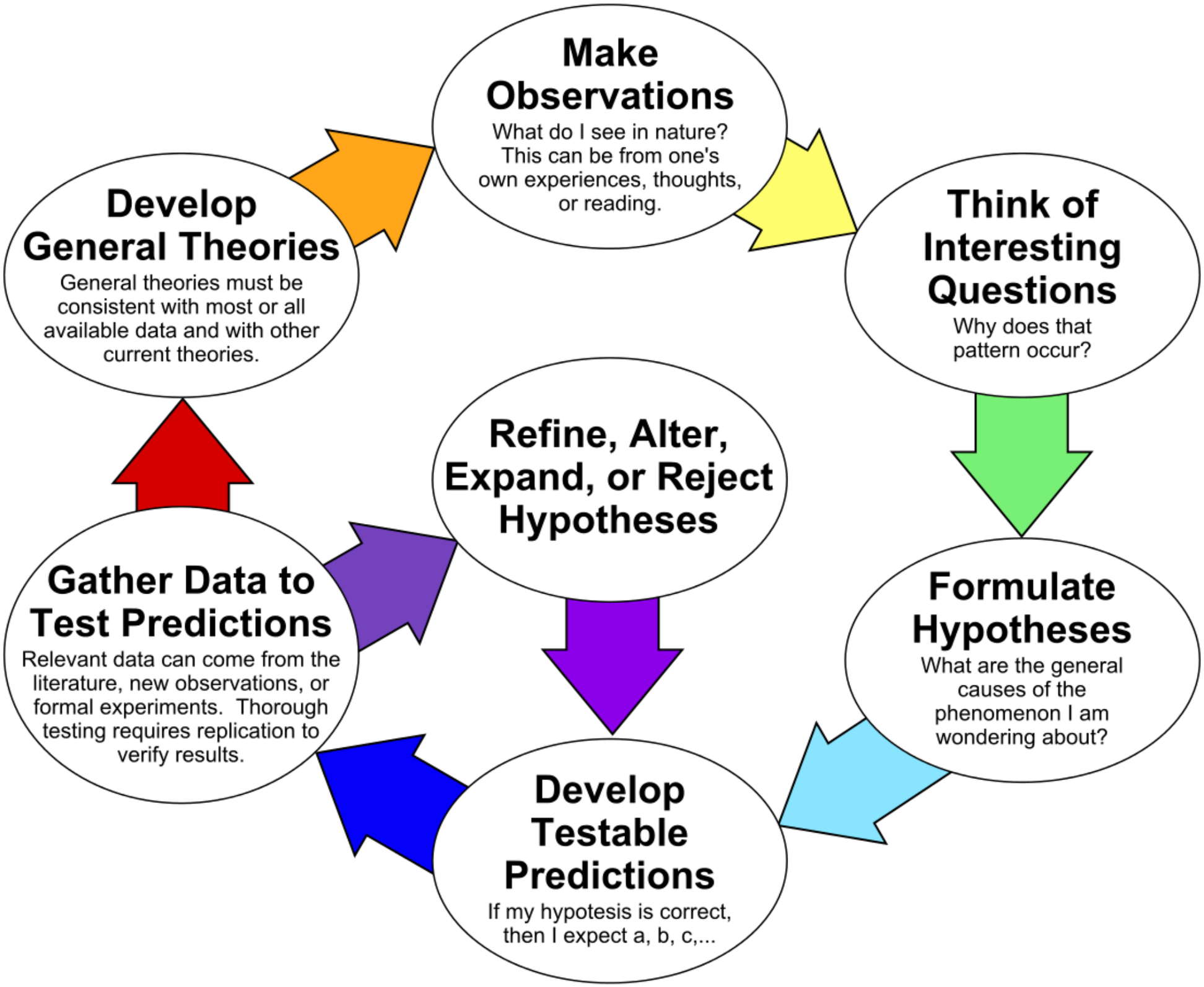
1. Gathering information
   — by observation, experience, or experimentation

2. Formulate a hypothesis
   — either through observation/experience of phenomena, or through a theory

3. Test the hypothesis

4. Draw conclusions

The Scientific Method as an Ongoing Process



https://en.wikipedia.org/wiki/Scientific_method

Economist as policy advisor

- Positive statements versus normative statements
  - S1: *Minimum wage laws cause unemployment*
  - S2: *The government should raise the minimum wage*

- Positive statements are descriptive, making a claim about how the world **is**. (Testable)

- Normative statements are prescriptive, making a claim about how the world **ought to be**. (Include opinions)

Economists often disagree

- Differences in scientific judgements
  ⇨ will lead to different positive views

- Differences in values
  ⇨ will lead to different normative views

What is econometrics?

Econometricians may give different answers!

- Econometrics is the science of testing economic theories.

- Econometrics is the set of tools used for forecasting future values of economic variables.

- Econometrics is the process of fitting mathematical economic models to real-world data.

- Econometrics is the science and art of using historical data to make quantitative policy recommendations in government and business.

Econometrics is the *science* and *art* of using economic theory and statistical techniques to analyze economic data.

Econometric questions examined in this course

- Does reducing class size improve elementary school education?

- Is there racial discrimination in the market for home loans?

- How much do cigarette taxes reduce smoking?

From *economic* model to *econometric* model

- An economic model of crime
  - Nobel Prize winner Gary Becker postulated a utility maximization framework to describe an individual's participation in crime.
  - We can derive an equation describing the amount of time spent in criminal activity as a function of various factors

$$y = f(x_1, x_2, \ldots, x_n)$$

where

y = hour spent in criminal activities,

x_1 = "wage" for an hour spent in criminal activities,

x_2 = hourly wage in legal employment,

...

From *economic* model to *econometric* model

- An econometric model of crime

$$crime = \beta_0 + \beta_1 wage_m + \beta_2 othinc + \beta_3 freqarr + \beta_4 freqconv + \beta_5 avgsen + \beta_6 age + u,$$

where

$crime$ = some measure of the frequency of criminal activity,
$wage_m$ = the wage that can be earned in legal employment,
$othinc$ = the income from other sources (assets, inheritance, and so on),
$freqarr$ = the frequency of arrests for prior infractions (to approximate the probability of arrest),
$freqconv$ = the frequency of conviction, and
$avgsen$ = the average sentence length after conviction.

Causal effects

- Causality: a specific action leads to a specific, measurable consequence.
  - Putting fertilizer on your tomato plants causes them to produce more tomatoes.

- Measuring causal effects through **randomized controlled experiments**.
  - In such an experiment, the only systematic reason for differences in outcomes between the **treatment** and the **control** groups is the treatment itself.

Ceteris paribus

- Ceteris paribus — other relevant factors being equal
- Most economics questions are ceteris paribus.
- In econometrics it is usually ceteris *not* paribus.
  - Measuring the return to education