Econometrics 1 *Applied Econometrics with R*

Lecture 1: Introduction

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Why are you studying economics?

- What do you want to be?
  career design (1, 5, 10, 20 years after graduation)
- What are you going to do here?

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

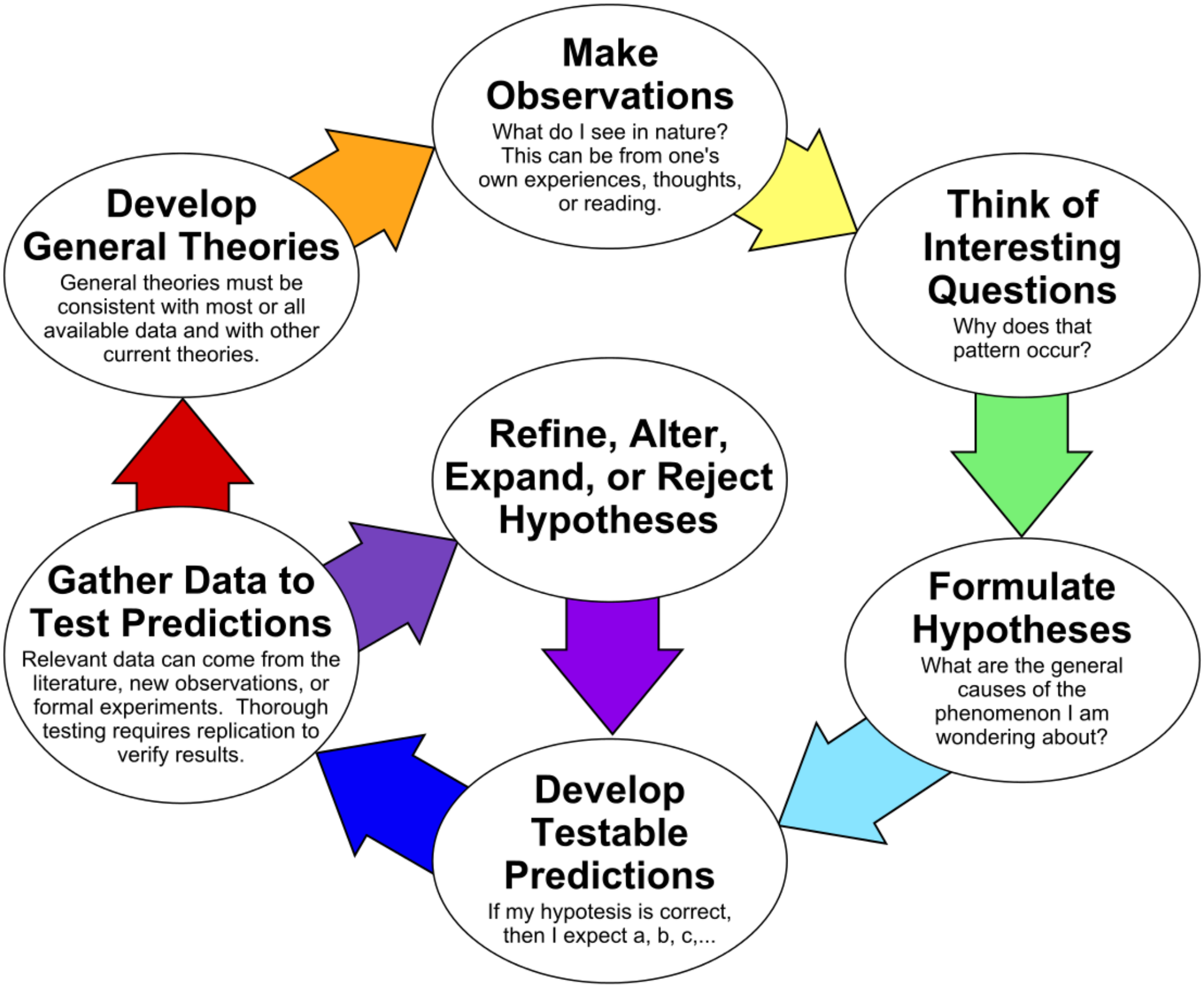
1. Gathering information
   — by observation, experience, or experimentation

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?

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.

Sources and types of data

- Sources
  - Experimental data versus observational data
- Types
  - Cross-sectional data
  - Time series data
  - Panel data (longitudinal data)

Cross-sectional data

TABLE 1.1 A Cross-Sectional Data Set on Wages and Other Individual Characteristics

obsno	wage	educ	exper	female	married
1	3.10	11	2	1	0
2	3.24	12	22	1	1
3	3.00	11	2	0	0
4	6.00	8	44	0	1
5	5.30	12	7	0	1
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
525	11.56	16	5	0	1
526	3.50	14	5	1	0

Time series data

TABLE 1.3 Minimum Wage, Unemployment, and Related Data for Puerto Rico

obsno	year	avgmin	avgcov	prunemp	prgnp
1	1950	0.20	20.1	15.4	878.7
2	1951	0.21	20.7	16.0	925.0
3	1952	0.23	22.6	14.8	1015.9
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
37	1986	3.35	58.1	18.9	4281.6
38	1987	3.35	58.2	16.8	4496.7

Panel data

TABLE 1.5 A Two-Year Panel Data Set on City Crime Statistics

obsno	city	year	murders	population	unem	police
1	1	1986	5	350000	8.7	440
2	1	1990	8	359200	7.2	471
3	2	1986	2	64300	5.4	75
4	2	1990	1	65100	5.5	75
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
297	149	1986	10	260700	9.6	286
298	149	1990	6	245000	9.8	334
299	150	1986	25	543000	4.3	520
300	150	1990	32	546200	5.2	493

Course Information

The purpose of this course

- Learn introductory econometrics

  Basic theories (models) and how to apply them.

- Learn how to use R both as an analyzing tool and a programing language

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

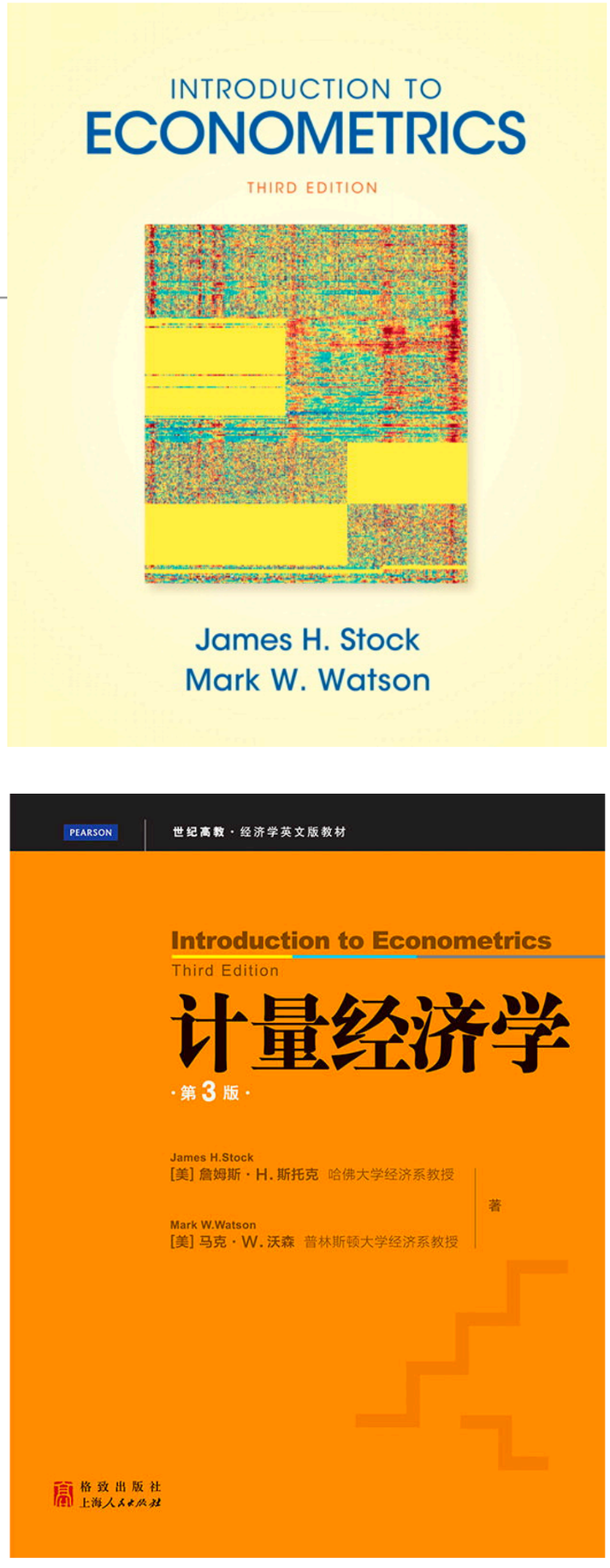
  Reading and discussing papers.

The contents of this course

- Basic R programming
- Probability & statistics
- Estimation
- Hypothesis testing
- Linear regression
  one regressor
  multiple regressor
- Nonlinear regression
- Panel data
- Binary dependent variables
- Instrumental variables
- Experiments & quasi-experiments

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 4 × 10%
  - Reading report 10%
  - Final exam 50%
- Course website

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

Homework (not an assignment)

- Install R and RStudio into your own laptop.
  - Follow the steps in `http://huangjp.com/teaching/rinstall.html`
- You need to bring your laptop from next week.