Welcome to

Econ 3334
Introductory Econometrics

Teaching Team

- Instructor: Xun (Sean) Lu (陆迅)

  Associate Professor, Department of Economics

  Specialty: Econometrics

- Teaching Assistant: Peter Tsui

Lecture and Tutorial Information:

Lecture

- Tuesday and Thursday
- Webpage: http://canvas.ust.hk

Lecture and Tutorial Information:

Tutorial

- Not weekly, about 8 tutorials
- The first week will NOT have any tutorial.
- Each time before the tutorial, the TA will make an announcement on Canvas and send an email to everyone

Textbook

- Required:

  Stock, James H., and Mark W. Watson.

  Introduction to Econometrics. (4th edition) Pearson.

- This book is available at HKUST book store.
- Recommended:

  Jeffrey M. Wooldridge.

  Introductory Econometrics. (7th edition), South-Western.

  Peter Kennedy.

  A Guide to Econometrics. (6th Edition), Wiley-Blackwell

Web page

- The course materials will be posted on: canvas.ust.hk.
- You should be able to log into the course web site using your regular ITSC account name .
- Throughout the semester, TA and I will make announcements through the mail function in Canvas.
- Make sure to check Canvas at least twice per week for announcements and course materials.

Stata / R

- You will need access to Stata or Python, which are commonly used statistical software.
- You do NOT need to buy Stata: Lab LSKG021 has it.
- I will reserve some time slots for ECON3334. The detailed time slots will be announced on Canvas.
- Other time slots depend on whether the lab is occupied.
- Python is free.
- I will walk you through Stata or Python during the lectures or tutorials.
- Other popular software: Matlab, R
- You can choose your favorite software.

Problem Sets

- There will be 6 assignments, each of which will carry a weight of 3% towards the final grade.
- The lowest grade will be dropped.
- Group study and free discussion are encouraged. But you should submit your own answers. Copying others' answers will be treated as cheating.
- If you have any question on the problem sets, please ask me or TA's during our office hours. Our office hours are for you.
- Each problem set is to be handed in at the beginning of class on the day it is due

Exams

- There will be one mid-term exam and one final exam.
- The mid-term carries a weight of 30%.
- The final exam has a weight of 55%.
- The final is cumulative and will cover all the course materials.

Exams (cont'd)

- All exams will be closed book.
- There will be no make-up exams. If you miss a midterm, you will receive a zero. The only exception is a verifiable medical reason, in which case the weight of the missed mid-term will be shifted to the final.
- Finally, if you are caught cheating, you will receive a zero on the exam, may fail the course, and may be subject to further disciplinary action by HKUST.

Summary of Grading

Assessment Activities	Weighting
Problems sets	15%
Mid-term	30%
Final Exam	55%

- What's an A? A-? B+? etc…

  It all depends on how everybody does at the end of the course and where you lie in the distribution.

Lecture Attendance

- PLEASE come to class because…
  - There is a lot of material, and I will go over the most important topics during class.
  - You are responsible for everything presented during lectures.
  - I may check attendance and give bonus points.
  - ???

Class Rules

- No electronic devices (e.g., phone, etc.).
  - http://youtube.com/watch?v=hut3VRL5XRE
  - http://www.youtube.com/watch?v=spKuQAdf5r8&feature=related
- Drinks and small snacks are fine, but please don't bring a seven-course meal.
- You can sleep, but you can't snore.
- Please no excessive talking during lectures (including talking in your sleep).
- ???

Office Hours

- Xun Lu
- Office Hours: 12:30pm-1:20pm, Tuesday in LSK6077 or by appointment, or ANY time you can find me.
- I prefer talking to you in person. I feel that Email is not a very efficient way to ask econometric questions. However, if you have a time conflict, feel free to drop us a line. Please include "ECON3334" in your subject.
- If you don't receive my reply in 2 days, send it again.
- I wish I can get to know each of you. So feel free to stop by with questions or anything you want to share.

Enrollment problem?

- Please send email to Leonna

  leonna@ust.hk

  or

- find Leonna at the general office of Department of Economics (6th floor, LSK). (Avoid lunch time: 1-2pm).

How difficult is this course?

- Some comments from previous students:
- Too easy?

"The professor could include more mathematics in the course, like proof…I cannot see much value in ECON3334 if it still focuses on the non-mathematical materials."

"can discuss some topics in depth, too easy for this course"

- Too difficult?

"the course content is rather difficult for people without solid mathematics background."

"i think the course involves too much calculations and mathematical proof"

"The course requires a lot maths derivation and non-maths students need great effort to catch up."

How difficult is this course?

- A mathematic background assessment today for two reasons:
  - It will provide useful information for me to design the course
  - It will provide useful information for you to decide whether to enroll in this course

- It has absolutely nothing to do with your course grade. But please try your best.

How useful is this course?

- It is very useful for your future career
- These methods are widely used in business, finance and many related fields.
- Example: economics consulting firms, financial companies
- Also these methods are widely used in empiric research.

Advice for this course

- Read the textbook and lecture notes before coming to the lecture. You have to read it anyway.
- Practice the questions at the end of each chapter and play with Stata
- You need to follow the course step by step.
  - For example, you need have a good working knowledge of probability and statistics in order to understand regression with one regressor
  - You need have a good working knowledge of regression with one regressor in order to understand regression with multiple regressors.
- Talk to me or the TA if you have any difficulty

Advice for this course

"I hear and I forget.

I see and I remember.

I do and I understand.''

--- Confucius

What is econometrics?

- Econometrics bridges the gap between abstract economic theory and real-world data.
  - For example, micro theory suggests that there is a negative relationship between price and quantity demanded.
  - We can use econometrics on actual price & quantity data to determine if the relationship is in fact negative.
- It is both an art and a science.
  - Science part is the mathematics.
  - Art part is creativity and judgment in applying the math appropriately.
- Basically, the goal of econometrics is to turn data into useful information.

What is econometrics?

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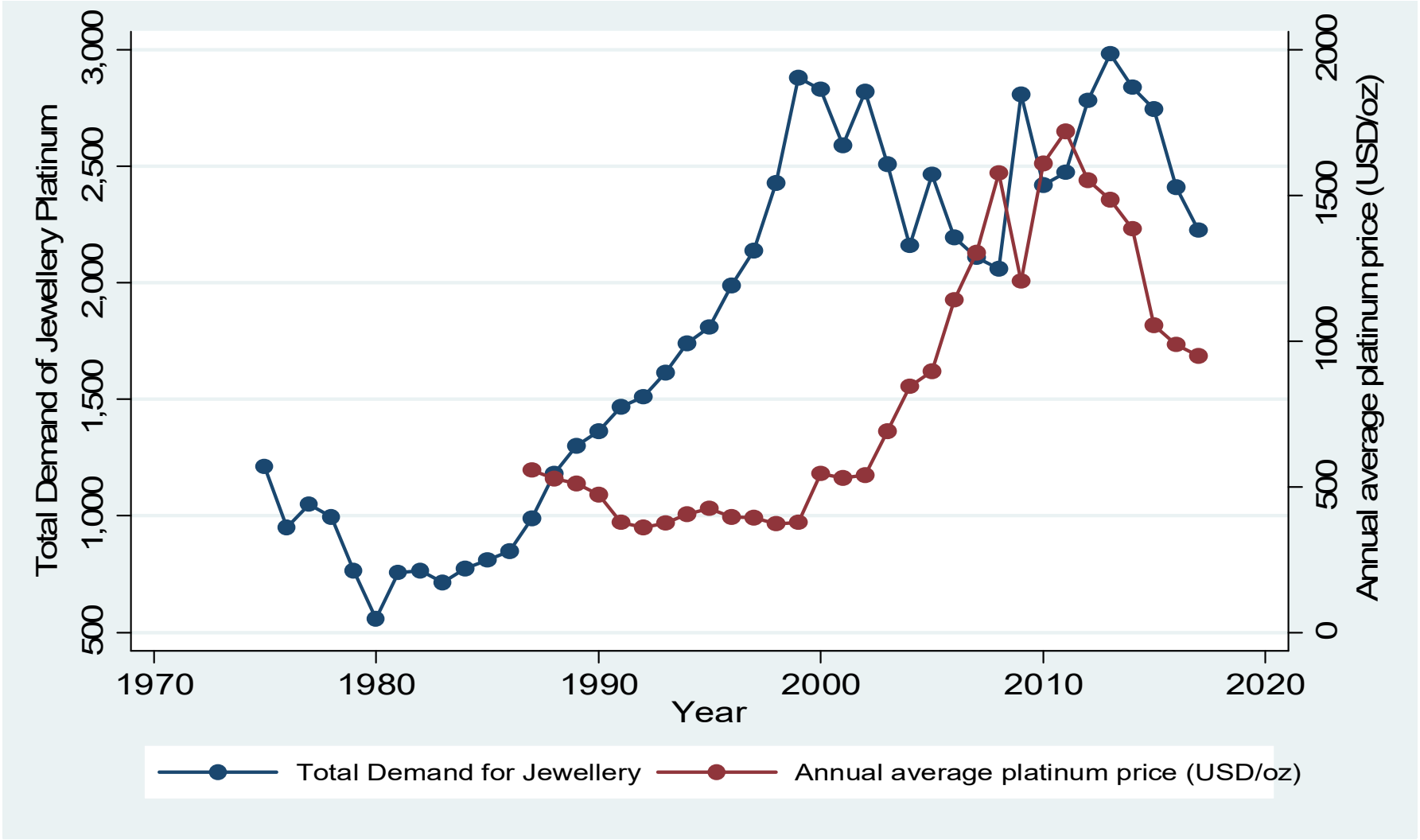
- An example



What is econometrics?

- You can think of econometrics as being composed of
  - Mathematics
  - Statistics
  - Economics
- There are basically two types of econometrics.
  - Econometric Theory - Developing the methodologies
  - Applied Econometrics - Taking the methodologies and applying them to data.

Data types

- Cross-sectional data: data on multiple entities (e.g., consumers) for a single time period.

  Example: GDP of all the 50 states in the U.S. in 2012.

- Time series data: data for a single entity collected at multiple periods.

  Example: GDP of California from 1990 to 2012.

- Panel data: data for multiple entities in which each entity is observed at multiple periods

  Example: GDP of all the 50 states in the U.S. from 1990 to 2009

- Econ 3334 focuses on Cross-sectional data!

Data types

Data1 :

Country	Year	GDP	Unemploy.
USA	1991	9.5	8
China	1991	7.4	11
Canada	1991	8	7

Data 2 :

Country	Year	GDP	Unemploy.
USA	1991	9.5	8
USA	1992	9.7	7.5
USA	1993	9.8	8.1

Data types

Data 3 :

Country	Year	GDP	Unemploy.
USA	1991	9.5	8
USA	1992	9.7	7.5
USA	1993	9.8	8.1
China	1991	7.4	11
China	1992	8.8	9.1
China	1993	8.9	8.4
Canada	1991	8	7
Canada	1992	9.2	7.6
Canada	1993	9.1	8.1

Data types

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Real data example: www.gapminder.org/tools/

Why econometrics?

- Two main purposes of econometrics:
  - Estimating the causal effects of X on Y
  - Forecasting

Causal effects

- Example:
- Why do you want to come to UST for a college degree?
- How do you convince me?
- How do you quantify your results?

Causal effects

- Example:
- Economic theory (micro and macro) suggests important relationships, often with policy implications, but virtually never suggests *quantitative magnitudes* of causal effects.
  - What is the *quantitative* effect of reducing class size on student achievement?
  - How does another year of education change earnings?
  - What is the price elasticity of cigarettes?
  - What is the effect on output growth of a 1 percentage point increase in interest rates by the Fed?
  - What is the effect on housing prices of environmental improvements?

Causal effects and experiments

- Ideally, we would like an experiment
- In economics, we rarely have the ability to conduct controlled experiments.
- In bio, chem, & physics, they can conduct controlled experiments in a laboratory.
- If you can do an ideal experiment where the only thing that changes is the treatment, then whatever that treatment's effect is on an outcome is the causal effect.
  - E.g., a pharmaceutical company wants to know the effect of a new drug on weight-loss.

Causal effects and experiments

- Pharma Example - Ideal Experiment
- E.g., a pharmaceutical company wants to know the effect of a new drug's effect on weightloss.
  - They gather 500 lab rats.
  - They split the rats **randomly** into two groups: treatment and control.
  - They give the treatment group the weightloss dose for 6 months.
  - They give the control group a "fake" dose (placebo) for 6 months.

Causal effects and experiments

- Pharma Example - Cont'd

- After the 6 months, they weigh each rat
  - Avg. weight of treatment group = 12 oz.
  - Avg. weight of control group = 15 oz.

- The causal effects: 12oz-15oz=-3oz.

Causal effects

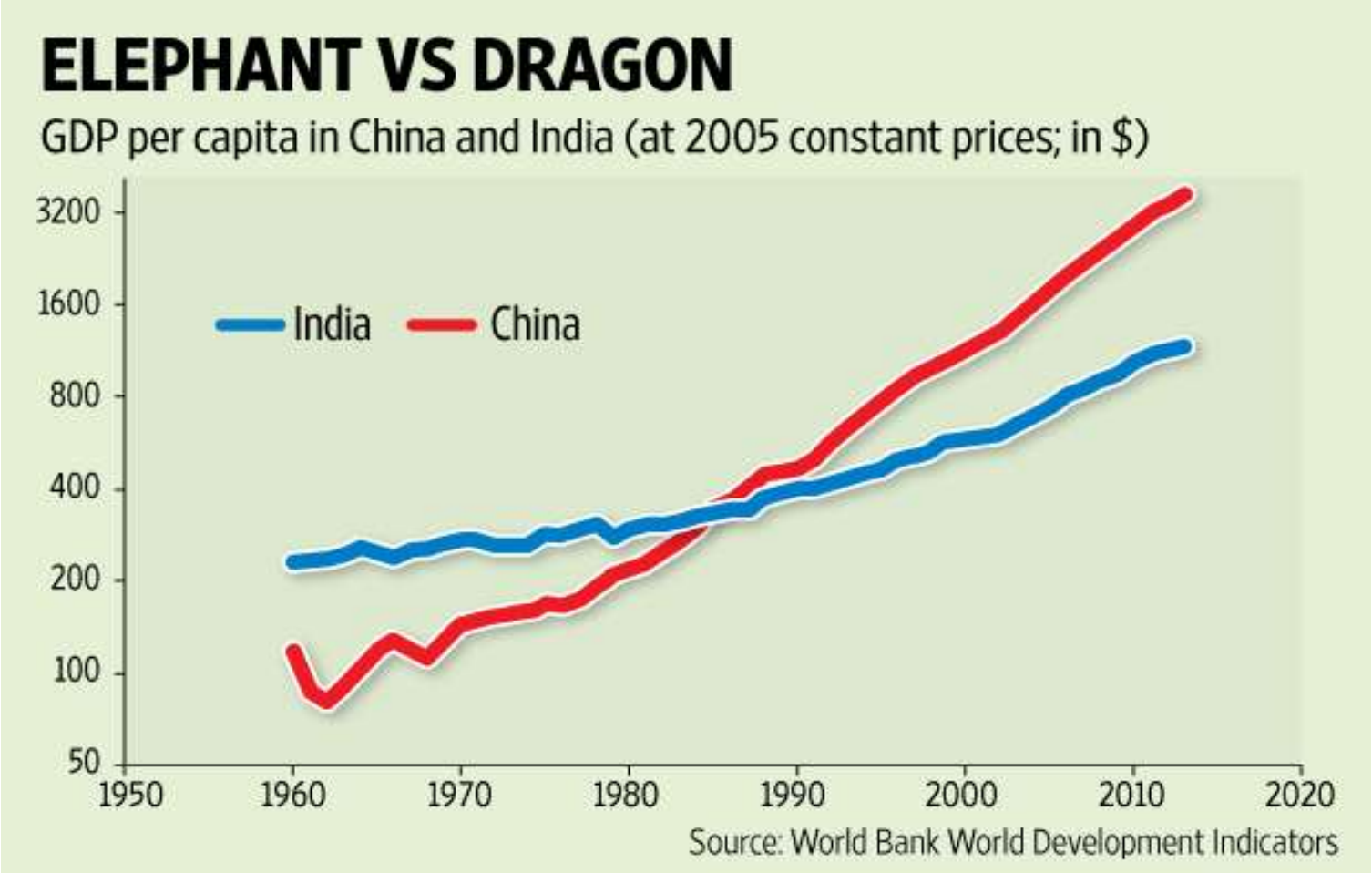
- The Problem in Economic Studies
  - The problem that we have in economics is we don't have the ability to conduct ideal experiments.
  - We can only do observational studies rather than ideal experiments.
    - E.g., suppose we want to obtain the causal effect of a cigarette tax on cigarette consumption.
    - We don't have the ability to split the country into two random groups of people.
    - We can't impose the tax on one group (the treatment), while not imposing the tax on the other group (control).

Causal effects

- The Problem in Economic Studies
  - To make matters worse, a bunch of things might be changing at the same time.
  - But econometrics gives us a way to control for other stuff that might be changing, and gives us some solutions to obtaining causal effects even without being able to do ideal experiments.

Forecasting

- A very useful aspect of econometrics is it gives us tools to predict or forecast events that haven't occurred.



Forecasting

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- Shanghai A share index

Forecasting

- Other example:
  - Apple might be interested in forecasting iphone sales next year.
  - Labor analysts might be interested in forecasting unemployment next year.
  - Pepsi might be interested in predicting how popular a new product line will be.

Data sources

- If you can do an experiment, then you can just get that data and do some simple stats for the analysis.
- Otherwise, you have to rely on observational data.
  - US data
    - Macro data is available from the Fed, BEA (Bureau of Economic Analysis), BLS (Bureau of Labor Statistics).
    - Demographics data is available from the BLS and the Census Bureau
    - CPI and PPI is available from the BLS…
  - Hong Kong data:
    - Hong Kong monetary authority…
  - Company stock data is available from many internet sources (Bloomberg, Yahoo, etc.).
  - A lot of data is private information or difficult to obtain.

Main Topics

- Review of probability theory
- Review of basic statistics
- Simple linear regression: Estimation and Inference
- Multiple regression: Estimation and Inference
- Nonlinear regression function
- Internal and external validity

Main Topics

- Learn methods for estimating causal effects using observational data
- Learn some tools that can be used for other purposes; for example, forecasting using time series data;
- Focus on applications – theory is used only as needed to understand the whys of the methods;
- Learn to evaluate the regression analysis of others – this means you will be able to read/understand empirical economics papers in other econ courses;
- Get some hands-on experience with regression analysis in your problem sets.