From Economics to R

Using R in Economics and Econometrics

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2nd Chinese R Conference,
Renmin University of China, 6th, Dec, 2009

Outline

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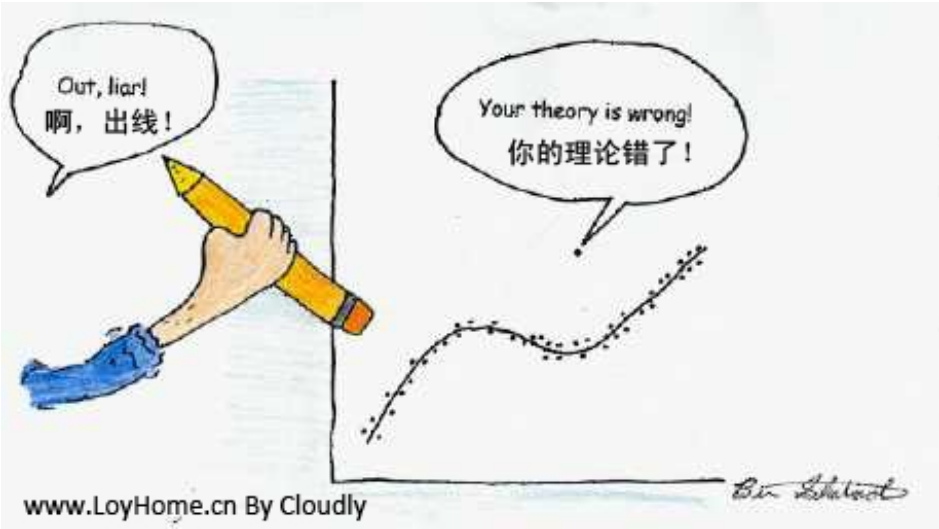
Economic Research

Why can't we leave statistics when doing economic research?

To what extend do economists need statistics?

- Is statistics the only tool for modern economic research?



The position of statistics

What's the position of statistics in economic research?

- Theoretical and empirical research
  - Theoretical model to explain why something has happened.
  - Empirical result to persuade the readers that it is true.

statistics and econometics

- Econometrics is the most powerful (or ironically, easiest?) tool for them to write a paper.

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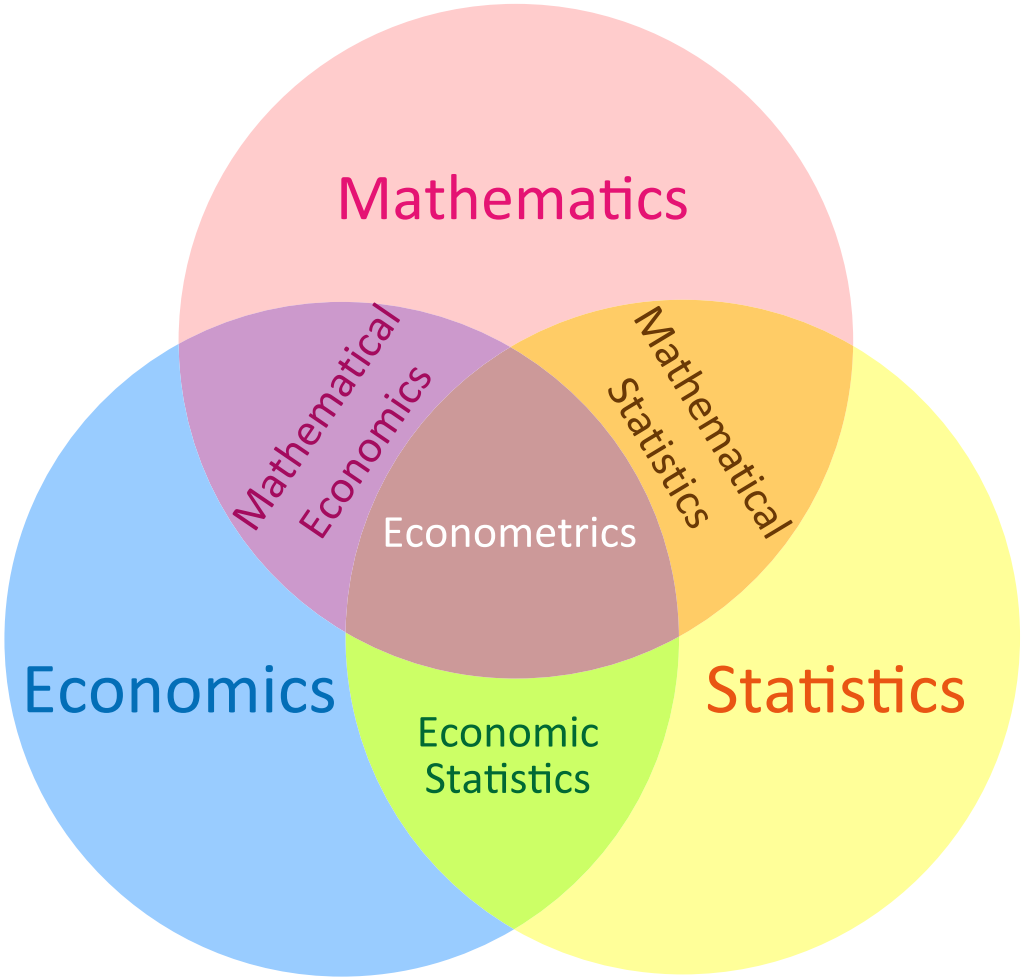

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- Econometrics is concerned with the tasks of developing and applying quantitative or statistical methods to the study and elucidation of economic principles (From wikipedia).

What does an econometrician do?

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Economists do regressions ONLY

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A simple list

What can I see around me?

1. Stata: No matter Macro- or Micro- econometric research, Stata can handle. Too many packages available makes it easy to do a regression or an estimation.
2. SPSS: Maybe a managemet student loves it better: a foolproof way (just click, click and click) of using a variety of statistic functions
3. Eviews: Too old to remember, but what can we do with the out-of-fashion textbooks? Anyway, it specializes more in time-series analysis.

A simple list

What can I see around me?

- SAS: I have no idea with it, since most economic students are afraid of learning programming, and I have even been told that "I do not want to see it anymore!". That is an economist: maximize his own utility or reach a particular goal with minimal cost.
- Matlab: Give me a reason to refuse it! –>R?

Where is R?

- In fact, seldom can I hear from a person who says he/she has heard about R.

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Core Methods

Example

Regression:

- Ordinary Least Squares (OLS)
- GLS/FGLS (Heteroskedasticity...)
- 2SLS (IV model)
- Quantile Regression

and figures (e.g. scatter graph)

Example

Parameter Estimation:

- Maximum Likelihood Estimate (MLE)
- Generalized Method of Moment (GMM)

Time-series Analysis:

- ARMA, ARCH...

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Leading?

American Economic Review

- The *American Economic Review* is the best economic journal around the world. I chose the issue of Jun, 2009.
  - Total articles: 18
  - Pure theoretical: 8
  - Main econometric methods: GMM+Panel Data, Poisson Regression, GMM+3SLS, OLS+Probit, Ordered Probit, Hedonic Regression, Dynamic OLS.

Leading?

- However, AER is a comprehensive journal rather than a econometric one. The methods may not be the most cutting-edge. Therefore, the *The Review of Economics and Statistics* shall be more convincing (I'm sorry that I cannot find *Econometrica* in my school's resource room).

The Review of Economics and Statistics

- Issue: Feb, 2009
- Main econometric methods: Bayesian and fat-tail, ZIP(zero-inflated possion), OLS+IV, Logit, Probit, Panel (fixed effect)

Chinese Journals

Then Let's have a look at domestic journals.

Economic Research Journal

- The *Economic Research Journal* is the best economic journal in China.
- Issue: Jul-Oct, 2009
- Total articles: about 50
- Empirical Research: about 35
- Main econometric methods:
  - MLE,LIML, GMM (2), Systematic GMM (2)
  - OLS (8), Dynamic OLS, 2SLS (4), B2SLS, WLS, 3SLS
  - Panel (fixed effect, 3), Dynamic Panel (2), Granger Causality Test, Var (2), VECM
  - Bootstrap, Stochastic Probit (2), PEA (2), MGARCH

Chinese Journals

Then let's pay attention to a more theoretical journal: *China Economic Quarterly*

China Economic Quarterly

- Issue: Apr, 2009
- Total article: 18
- Empirical research: 8
- Methods: GLS, 2SLS, Probit, GMM (3), HP, VAR, Panel (fixed effect)

World Economy, The Journal of Quantitative and Technical Economics

- Empirical/Total:5/7, 10/10
- SVAR (2), Dynamic Panel (2), FGLS, Ordered probit, DAG, 3SLS, MLE (2),SFA (2), Markov chain, TARCH

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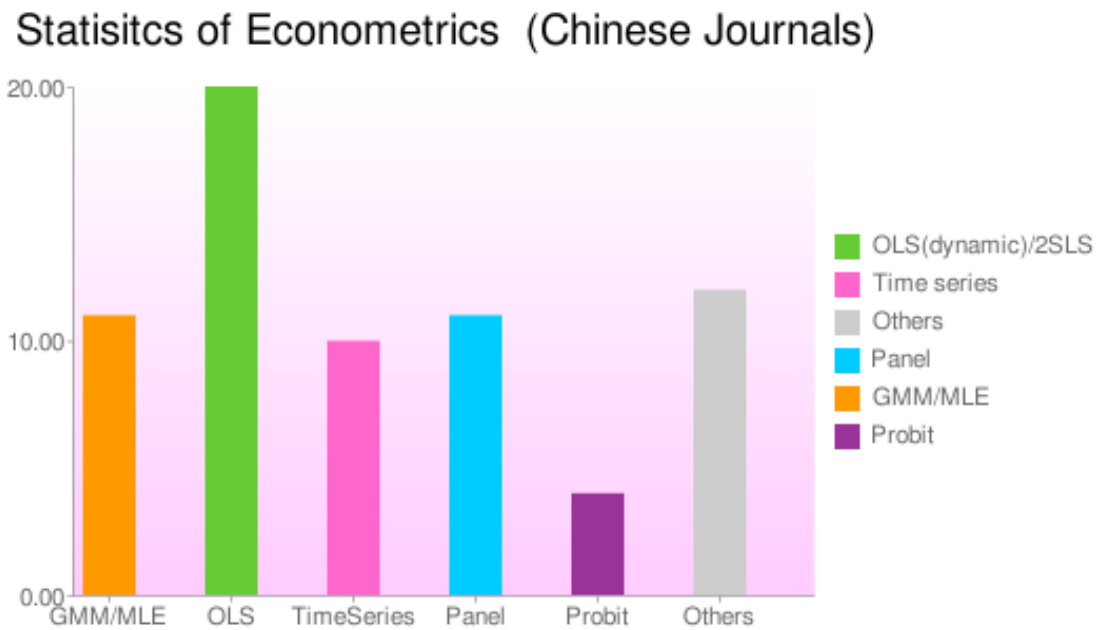
Chinese Journals

Statistic journals

- *Application of Statistics and Management, Chinese Journal of Applied Probability and Statisties, Statistical Research*
- Related to economics/ Total: 1/10, 9/12, 10/16
- Nonparametric Estimation, SFA, Spatial econometrics (2), Bayes.



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OLS and Regression

OLS in R

- OLS:
  - lm(crime ~ poverty + single, data=crime2)
- Robust regression (package MASS):
  - rlm(crime ~poverty + single, data=crime2)

Equation System Estimation in R

- Equation System Estimation (systemfit package)
  - OLS, Weighted Least Squares (WLS)
  - Seemingly Unrelated Regression (SUR)
  - Two-Stage Least Squares (2SLS), Weighted Two-Stage Least Squares (W2SLS), Three-Stage Least Squares (3SLS).

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MLE & GMM

MLE in R

- mle(minuslogl, start = formals(minuslogl), method = "BFGS", fixed = list(), ...)

GMM in R (package GMM)

- GMM: gmm(g,x)

Quantile Regression (package quantreg)

- rq(stack.loss ~ stack.x,.5) #median (l1) regression fit for the stackloss data.
- rq(stack.loss ~ stack.x,.25) #the 1st quartile

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Time Series Analysis

ARMA & ARIMA

- stats-package
  - arma(s, order=c(20,0)
  - arima(lh, order = c(1,0,0))

ARCH

- arch(x, lags.single = 16, lags.multi = 5, multivariate.only = TRUE)

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Panel Data

plm Package

- Panel data econometrics is obviously one of the main fields in the profession, but most of the models used are difficult to estimate with R.
- plm is a package for R which intends to make the estimation of linear panel models straightforward. plm provides functions to estimate a wide variety of models and to make (robust) inference.

From: Giovanni Millo & Yves Croissant, 2008. "Panel Data Econometrics in R: The plm Package," *Journal of Statistical Software*, American Statistical Association, vol. 27(02), 07.

Outline

Data

- foreign (package): Read Data Stored by
- Minitab, S,
- SAS
- SPSS
- Stata
- Systat, dBase, ...

Outline

LaTeX

- Sweave allows R code to be included in a latex file.
- This is a good marriage
  - latex provides typeset text
  - R is statistically and graphic oriented

Outline

Micro and Macro Econometrics

- Maybe many people think that econometric methods are most essential in macroeconomics.
- However, in recent year, more and more microeconomic researchers are concerning micro-level data.
- For example, in the field of labor economics, we often use Quantile Regression to illustrator the differences among different groups (based on percentile).

example about quantile regression

- Zhang Juwei and Xue Xinxin, 2008, "State and Non-state Sector Wage Differentials and Human Capital Contribution", *Economic Research Journal*, 2008(4).

Cooperation and Combination

- I've recently finished a paper about microeconomics, and the next step I need to do is dealing with thousands of transaction data.
- At least, most economists lack the ability to find/collect useful data.
- Overall, while the economic student are studying statistic knowledges actively, I really hope that some statistic students (or if possible, professors are more welcome) can pay attention to the economic area and make a contribution.

Mutual Beneficial

- In economics we often talk about "social division of labor" and "comparative advantage".
- The probable cooperation between statisticians and economists will be mutual beneficial.
- In fact, the opportunity of communication like this conference is the most ideal case in an economic view (So I really appreciate the chance to participate here. Thank you all!).

Conclusion

- That is more easy than it seems to be.

Thank You!