Kobe University
Graduate School of Economics

Econometrics [3E642][3B780][3E343][3E813][3J314] Syllabus

Third Quarter, 2019

Instructor
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Hours: By appointment

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Class Times: Wednesday, Periods 3 and 4 (13:20 - 14:50 and 15:10 - 16:40)
Room: NTT Data IT Room (情報処理教室), 2nd Floor, Building III

Course Description: This course exposes students to common econometric techniques that economists use to estimate, test, and forecast relationships between variables in economics and finance. We cover applied econometrics and selective intermediate theory. Students will apply theory to empirical problems using economic and financial data in class and in assignments. Software packages used in class for applied econometric work will include R, RStudio, RMarkdown and GitHub. It is important that students become proficient in using the statistical software R to conduct empirical analysis. The course aims to equip students with empirical and theoretical knowledge necessary to understand and appraise empirical studies, and to conduct straightforward empirical research. While we can only cover a certain amount of econometric technique in one quarter, an objective of the course is to develop students' ability to teach themselves further techniques they may need for their research projects or future career.

Course Objectives:
1. Understand intermediate econometric theory.
2. Understand the approaches to econometric methodology.
3. Learn to apply theory appropriately to empirical problems.
4. Learn to teach yourself new econometric techniques via replication.
5. Become competent using R and associated tools for applied econometrics.

Credits: 2.0

Language: English

Software: We will use the statistical software R and the interface RStudio for our empirical work in this course. R is a free, flexible and powerful language and environment for statistical computing and graphics. R provides access to a vast and increasing range of econometric techniques. RStudio provides an easy and convenient way to use R. We will use R and RStudio in the computer lab. If you have access to a computer, please download and install both R and RStudio. You may bring your own computer to use in the class. Within R we will use the package RMarkdown which works with the application LaTeX. We will also use GitHub, a software version control system, for the submission of assignments. I will provide you with a separate document providing set-up instructions and listing useful resources for the packages.

Evaluation:

Assignments	10%
Empirical Replication Project	35%
Final Exam	55%

Assignments: Several assignments (approximately weekly) will be given and assessed on a pass/fail basis. The assignments will include work like summarising an academic article related to topics we are covering in class, or completing some empirical work or problems. Doing the assignments will prepare you for some of the questions asked in the final exam.

Empirical Replication Project: You will be required to select a published empirical paper (to be approved by me) and document your attempt to replicate the econometric analysis and results of the paper. Details of the replication project will be provided separately.

Final Exam: The final exam will be held on **Wednesday 27 November 2019**. In principle, no supplementary exams will be provided unless there are extenuating circumstances. It is your responsibility to make sure you attend the final exam and hand in the required assignments and project on time. The exam will be closed book. A calculator may be required. Mobile telephones, tablets or other devices are not permitted.

Prerequisites & Preparation: Ideally students will have completed one or more econometrics or statistics courses. Students who have not taken any prior relevant courses will need to supplement their knowledge with self study of introductory topics. Review mathematics, statistics and linear algebra prior to the course. Appropriate material to cover on linear algebra, probability and statistics can be found in Wooldridge (2013) Appendices A-D. Material to cover on the linear regression model can be found in Wooldridge (2013) Chapters 2-6 and 10-11.

Textbook: Required readings, mostly consisting of selected chapters from some books and academic journal articles, will be provided as handouts during class. In particular, we will cover material from Kleiber and Zeileis (2008) (available online at http://www.springer.com/gp/book/9780387773162 and Pfaff (2008) available online at http://www.springer.com/gp/book/9780387759661.

Reference Materials: Useful reference books include: Kennedy (2008), Tsay (2010), Tsay (2014), Enders (2015), Greene (2012), Stock and Watson (2011), Gujarati (2011), Rao et al. (2014), Pesaran (2015), Box et al. (2016), Vinod (2011), Shumway and Stoffer (2011). Some econometricians have written online textbooks that may be useful resources: Bruce Hansen's PhD level ebook can be downloaded from http://www.ssc.wisc.edu/~bhansen/econometrics/, and Francis Diebold has open textbooks on his website for econometrics, forecasting and time series econometrics at http://www.ssc.upenn.edu/~fdiebold/Textbooks.html.

Academic journals containing articles related to applied econometrics will be useful references for the course, and a good place to find a suitable replication paper. A brief list of applied econometrics journals includes: Journal of Business and Economic Statistics, Review of Economics and Statistics, Journal of Applied Econometrics, Journal of Forecasting, Oxford Bulletin of Economics and Statistics, Econometrics Journal (electronic), Studies in Nonlinear Dynamics and Econometrics (electronic), International Journal of Forecasting, Journal of Empirical Finance, Econometrics Letters. Journals containing econometric applications in economics and finance include: Journal of Monetary Economics, Journal of International Economics, Journal of International Money and Finance, Journal of Money, Credit and Banking, Applied Economics, Journal of Finance, Review of Financial Studies. Of course, there are many other good journals to look at.

Topics:

1. Introduction
   - (a) Course overview
   - (b) Tools and Setup: R, RStudio, RMarkdown, GitHub
   - (c) Replication in Economics and the Replication Project

2. R Basics
   - (a) Objects, Arithmetic and Linear Algebra
   - (b) Importing Data and Data Management
   - (c) Packages, Graphics and Formulas
   - (d) RMarkdown and LaTeX

3. Linear Regression
   - (a) Linear Regression Model Estimation in R
   - (b) CLRM Assumptions and Properties of OLSE
   - (c) Weights, Interaction Terms, Functional Form

4. Specification, Diagnostic Testing and Model Selection
   - (a) Descriptive Statistics and Measures of Fit
   - (b) Non-spherical Errors, Other Violations of Regression Assumptions
   - (c) Diagnostic Testing
   - (d) Model Selection, Nested and Non-nested Testing

5. Econometric Methodology
   - (a) Importance of methodology in applied econometrics
   - (b) Contributions of Hendry, Leamer, Sims, Angrist and Pischke

6. Non-stationarity
   - (a) Stationary and Non-stationary Data
   - (b) Problems with Non-stationary Data
   - (c) Unit Root Tests

7. AR, MA, and ARIMA Models
   - (a) Simulating ARMA Models
   - (b) Model Identification
   - (c) Estimation and Forecasting
   - (d) Seasonality

8. ARCH and GARCH Models
   - (a) Testing for ARCH
   - (b) Visualising Volatility
   - (c) Estimation and Forecasting, Moment Conditions
   - (d) GARCH Variants

9. Final Exam

The topics and schedule may be adjusted during the course.

References

Box, G. E. P., Jenkins, G. M., Reinsel, G. C., and Ljung, G. M. (2016). *Time series analysis: forecasting and control*. John Wiley, fifth ed. edition.

Enders, W. (2015). *Applied econometric time series*. Wiley, fourth edition.

Greene, W. H. (2012). *Econometric analysis*. Prentice Hall.

Gujarati, D. N. (2011). *Econometrics by example*. Palgrave Macmillan.

Kennedy, P. (2008). *A guide to econometrics*. Blackwell Pub, 6th edition.

Kleiber, C. and Zeileis, A. (2008). *Applied Econometrics with R*. Springer US, New York, 1st edition.

Pesaran, M. H. (2015). *Time series and panel data econometrics*. Oxford University Press.

Pfaff, B. (2008). *Analysis of Integrated and Cointegrated Time Series with R*. Springer-Verlag, New York, second edition.

Rao, K. S., Fabozzi, F. J., Focardi, S. M., Rachev, S. T., and Arshanapalli, B. G. (2014). *The basics of financial econometrics : tools, concepts, and asset management applications*, volume 15. Wiley.

Shumway, R. H. and Stoffer, D. S. (2011). *Time Series Analysis and Its Applications With R Examples*. Springer, third edition.

Stock, J. H. and Watson, M. W. (2011). *Introduction to econometrics*. Addison-Wesley.

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Vinod, H. D. (2011). *Hands-on intermediate econometrics using R : templates for extending dozens of practical examples*. World Scientific.

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