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Introduction

Econometrics II is an advanced course following Econometrics I. In Econometrics I, we have discussed the basic principles of model specification, estimation and inference methods for classical linear regressions. We have also introduced the basic notions of asymptotic analysis and the basic large-sample methods for statistical inference in the context of linear regressions. In Econometrics II, we plan to introduce a more complete framework of econometric analysis by completing our discussions about the constrained estimation methods and discussing a number of important econometric topics, including hypotheses testing and model selection, bootstrap and its properties, the problem of endogeneity and instrumental-variable (IV) estimation, and the generalized method of moments (GMM). In addition, we plan to introduce a basic framework of time-series analysis. In this part, we plan to discuss the basic types and properties of time-series data, the linear univariate and multivariate time-series models for stationary processes, and the non-stationarity of time series data. In this course, students may learn important econometric methods and basic principles of time-series analysis for their future empirical or econometric research, and may also enhance their programming skills in R via doing computer homework.

Lectures

1. Introduction

2. Constrained estimation (Ch.8 of Hansen's (2020) textbook)

   - Minimum distance (MD) estimator, asymptotic distribution of the MD, asymptotically efficient MD estimator, misspecification and local misspecification.

3. Hypothesis testing and model selection (Ch.9; Ch.28)

   - Hypotheses, type I error, type II error, significance, p-value, Wald test, score test, criterion-based test, testing consistency, asymptotic local power, information criterion, AIC and BIC.

4. Bootstrap (Ch.10)

   - Bootstrap algorithm, bootstrap moments, bootstrap distribution, bootstrap asymptotics, bootstrap consistency, bias correction, bootstrap tests, parametric bootstrap, bootstrap regression, and wild bootstrap.

5. Endogeneity and IVs (Ch.12)

   - Endogenous regressors, identification, two-stage LS (2SLS) and properties, generated regressors, control function, endogeneity tests, weak IVs.

6. GMM (Ch.13)

   - Moment equation models, method of moments, overidentified moment equations, GMM estimator, efficient GMM, overidentification test, conditional moment equation models.

 - **Midterm exam. 4/22**

7. Time series data (Ch.14)

   - Stationarity, convergent series, ergodicity, martingale difference, mixing, linear projection, white noise, Wold decomposition, lag operator, unit root.

8. Univariate time-series models (Ch.14)

   - Moving average (MA) processes, autoregressive (AR) processes, ARMA processes, ARIMA processes, time trend, time-series regressions, estimation, asymptotics.

9. Multivariate time-series models (Ch.15)

   - Linear projection, impulse response, VAR models, estimation, asymptotics, orthogonalized shocks, forecast error decomposition, recursive VAR, structural VAR.

10. Non-stationary time series (Ch.16)

    - Partial sum, functional convergence, functional CLT, integration order, unit-root tests, spurious regression, non-stationary VAR, cointegration, cointegrated VAR.

 - **Final exam. 6/24**

Requirements

Regular class attendance is a basic requirement. **Mathematical statistics**, **matrix algebra** and **Econometrics I** are required as background knowledge of this course. Computer homework needs to be done using **R** (`https://www.r-project.org/`).

Textbook & References

Textbook
Hansen, B. E. (**2020**), *Econometrics*, (`https://www.ssc.wisc.edu/~bhansen/econometrics/Econometrics.pdf`) Version: July, 2020.

References

1. Hansen, B. E. (2020), *Introduction to Econometrics*, (`https://www.ssc.wisc.edu/~bhansen/probability/Probability.pdf`)

(Not required. You may view it as an advanced book about mathematical statistics. It is provided only for reference.)

2. Hamilton, J. (1994), *Time Series Analysis*, Princeton University Press.

3. White, H. (2001), *Asymptotic Theory for Econometricians*, Academic Press.

Grade

- Midterm (40%), Final (40%), **Homework (every week)** (20%).

- Welcome to contact me for econometrics but NOT for grade.

Office Hours

- Before and **after** the classes

- By appointment

- Asks for TA's help