

TOPICS IN ECONOMETRICS

Module 1, 2022–2023

Professor: Stanislav Anatolyev

sanatoly@nes.ru

Course information

Course Website: my.nes.ru

Instructor's Office Hours: by appointment in Zoom

Class Time: TBA

Room: Zoom personal room <https://nesuniversity.zoom.us/j/5445851559>

Teaching Assistant: Anton Brennerman

Course description

The course features several interesting and important issues of the modern econometric theory. First, we will get acquainted with a more delicate asymptotic theory than we are accustomed to see and use, and look at some applications of such unconventional asymptotic theories. Second, we will see the beauty and elegance of the method of moments when manipulating moment conditions, constructing optimal instruments, use incorrect distributional assumptions, select models, etc.

Course requirements, grading, and attendance policies

There will be 4 homework assignments that account for 20% of the grade. The problems will be analytical, no computational exercises are planned. Suggested solutions will be distributed. The final exam accounting for 80% of the grade will have an open-book format.

Course contents

- I. **Higher order asymptotic theory and its applications**
 - Higher order stochastic expansions
 - Second order asymptotic bias
 - Asymptotic bias of OLS, 2SLS, ML and extremum estimators
 - Analytic, bootstrap and jackknife bias correction
 - Higher order efficiency of maximum likelihood

II. Alternative asymptotic theory and its applications

- Local asymptotic power of asymptotic tests
- Drifting DGP and alternative asymptotics
- Weak instrument asymptotics. GMM with weak identification. Fully robust tests
- Many instrument asymptotics: estimators and specification tests
- Many regressor asymptotics: estimation and hypothesis testing
- Near unit root asymptotics
- Alternative asymptotics in threshold regressions

III. Econometrics of moment conditions: optimal instruments

- Basic instruments, allowable instruments and optimality condition
- Conditional vs. unconditional moment restrictions
- Optimal instruments for IID data
- Optimal instruments in time series

IV. Econometrics of moment conditions: pseudo-maximum likelihood

- Kullback–Leibler Information Criterion (KLIC) and its properties
- Consistency and asymptotic normality under density misspecification: QML
- Information Matrix test
- Pseudo-Likelihood estimation: getting consistent estimates with wrong distribution
- Discrimination between non-nested models: Likelihood Ratio test

V. Econometrics of moment conditions: alternatives to GMM

- Finite sample deficiencies of GMM estimators. Continuously updating GMM
- Empirical Likelihood (EL) and Generalized EL (GEL) estimation
- Higher-order asymptotic properties of GMM and GEL
- GEL estimation in time series

Sample tasks for course evaluation

Discuss how various theories explain the dangers of using big sets of moment conditions.

Write out topics of all 7 applications of alternative (drifting DGP) asymptotic theories we discussed in class. Explain the purpose of introduction of those theories in each application.

Consider the standard logit model under random sampling. Suppose one wants to estimate it using the approach of optimal instrumentation.

1. Find the form of the optimal instrument. Describe how to implement it as fully as you can.
2. Write out as many as possible other estimators you know (not just names, write out the point estimators in full) that attain the same first order asymptotic efficiency.
3. How would your answer to part 1 change if the data instead were stationary time series?

Course materials

Required textbooks and materials

'Deep Purple': Anatolyev, S. and N. Gospodinov (2011). *Methods for Estimation and Inference in Modern Econometrics*, CRC Press Taylor&Francis

'Yello': Anatolyev, S. (2009). *Intermediate and Advanced Econometrics: Problems and Solutions*, 3rd edition, sections 15–17

Additional materials in Russian

Анатольев, С.А. (2005) Асимптотические приближения в современной эконометрике, *Экономика и математические методы* 41, стр. 84–94

Паган, Адриан (2007) Слабые инструменты, *Квантиль*, 2, стр. 71–81

Анатольев, С.А. (2007) Оптимальные инструменты, *Квантиль*, 2, стр. 61–69

Анатольев, С.А. (2019) Основы теории квази- и псевдо-правдоподобия, *Квантиль*, 14, стр. 45–52

Academic integrity policy

Cheating, plagiarism, and any other violations of academic ethics at NES are not tolerated.