

## TOPICS IN ECONOMETRICS

Module 5, 2020–2021

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### Course information

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**Course Website:** [my.nes.ru](http://my.nes.ru)

**Instructor's Office Hours:** by appointment

**Class Time:** TBA

**Room Number:** TBA

**Teaching Assistant:** TBA

### Course description

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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

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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. At least 70% lecture attendance is mandatory for getting a passing grade.

### Course contents

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#### I. Higher order asymptotic theory and its applications

- Higher order stochastic expansions
- Second order asymptotic bias and analytic bias reduction
- 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. 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: serial correlation and conditional heteroskedasticity
- Redundancy of moment conditions

**IV. Econometrics of moment conditions: pseudo-maximum likelihood**

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

**V. Econometrics of moment conditions: alternatives to GMM**

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

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## **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**

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### **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**

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**

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