

New Economic School

INTERMEDIATE ECONOMETRICS (ECONOMETRICS III)

Module 5, 2009–2010

Professor: Stanislav Anatolyev

The course is a bridge between introductory econometric knowledge and serious thinking about econometric estimation and inference, when applied in both cross-sectional and time-series setting. Apart from reviewing important econometric notions and inference tools such as asymptotic theory and bootstrap, we concentrate on regression type models, both parametric, including linear and nonlinear, and non-parametric. Home assignments serve as an important ingredient of the learning process.

ORGANIZATION AND RULES

- There will be 5 weekly home assignments that account for 10% of the final grade. Home assignments will be posted regularly on my.nes.ru.
- Home assignments will contain analytical problems, as well as computer exercises based on the econometric language GAUSS.
- Solutions to home assignments may be submitted by one or two students. Student pairs should be formed at the beginning and must not change during the module.
- Any spillovers of solutions among groups, or traces of copying from previous years' materials are considered plagiarism.
- Answer keys (which may not constitute full solutions!) will be posted on my.nes.ru.
- The *Problems and Solutions* manual contains additional (mostly recycled previous years' exams) problems for independent work and discussion in sections.
- The final exam accounting for 90% of the grade will have an open-book format (allowable sources will be specified).
- Lecture and discussion section attendance of less than 50% immediately leads to denial of admittance to final and makeup exams.

TEXTS AND MANUALS

- Anatolyev, S. (2009) *Intermediate and Advanced Econometrics: Problems and Solutions*, 3rd edition, sections 1–8 and 14, New Economic School
- Goldberger, A. (1991) *A Course in Econometrics*, Harvard University Press
- Анато́льев, С. (2007) «Основы бутстрапирования», *Квантиль*, №3, сентябрь 2007 г. Доступно на <http://quantile.ru/03/N3.htm>
- Анато́льев, С. (2009) «Непараметрическая регрессия», *Квантиль*, №7, сентябрь 2009 г. Доступно на <http://quantile.ru/07/N7.htm>
- (optional) Анато́льев, С. (2006) *Курс лекций по эконометрике для продолжающих*, Российская Экономическая Школа
- (optional) Härdle, W. and O. Linton (1994) *Applied Nonparametric Methods*, in *Handbook of Econometrics*, volume 4, chapter 38, Elsevier Science

I. Econometric concepts and inference tools

1. Econometric concepts

- Conditional distribution and conditional expectation. Law of iterated expectations.
- Notion of regression. Mean, median and quantile regressions.
- Conditional expectation function and best linear predictor. Linear projection.
- Random sample and non-random sample. Analogy principle.
- Parametric, nonparametric and semi-parametric estimation.

2. Inference tools: asymptotic theory

- Approaches to inference: exact, asymptotic, bootstrap. Problems with exact inference.
- Review of asymptotic tools: convergence, LLN and CLT, continuous mapping theorems, delta-method.
- Asymptotic confidence intervals and large sample hypothesis testing under random sampling.
- Asymptotics with time series: stationarity, ergodicity, martingale difference sequence, ergodic theorem, CLT, HAC variance estimators.

3. Inference tools: bootstrap

- Bootstrap under random sampling: EDF, approximation by bootstrapping and approximation by simulations.
- Bootstrap bias correction, confidence intervals and hypothesis testing.
- Bootstrap resampling: non-parametric, residual, wild, block, stationary bootstraps.

II. Parametric Mean Regression

1. Linear mean regression

- OLS estimator. Asymptotic inference in linear mean regression model.
- Asymptotic efficiency. GLS estimator its asymptotics.
- Time series linear regression.

2. Nonlinear mean regression

- NLLS estimator. Asymptotic inference in nonlinear mean regression model.
- Computation of NLLS estimate: concentration method.
- Asymptotic Efficiency and Weighted NLLS estimator. Binary choice model.
- Inference when nuisance parameters are not identified under null hypothesis.

III. Nonparametric Mean Regression

- Discrete regressors: parametric rate of convergence.
- Continuous regressors: kernel estimator of mean regression and its asymptotics.
- Selection of bandwidth: plug-in, cross-validation.
- Practical aspects of kernel estimation.
- Multivariate kernel regression. Curse of dimensionality.
- Non-kernel nonparametric methods.