

New Economic School

ECONOMETRICS IV (ADVANCED ECONOMETRICS)

Module 1, 2010–2011

Professor: Stanislav Anatolyev

This course is a continuation of Econometrics III. This time we will concentrate on estimation and inference in nonlinear models. Beside the Nonlinear Least Squares estimation that we have already studied, the methods will include Maximum Likelihood and Generalized Method of Moments, the two leading contemporary econometric techniques. Also, we will devote a few lectures to learn how to handle panel data. The assigned exercises will include regular problems as well as computer tasks based on GAUSS. Home assignments serve as an important ingredient of the learning process.

ORGANIZATION

There will be six weekly homework assignments that account for 10% of the final grade. The assignment will contain both analytical problems and computer exercises in GAUSS. The solutions may be submitted by one or two students (student pairs should be formed at the beginning and must not change during the module). The groups should be determined at the beginning and should not change during the module. Any spillovers of solutions among groups, or traces of copying from previous years' materials are considered as plagiarism. Answer keys will be distributed. The *Problems and Solutions* manual contains additional problems for independent work and discussion in sections. The final exam, which accounts 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% of classes immediately leads to a denial of admittance to final and makeup exams.

TEXTS AND MANUALS

- Anatolyev, S. (2009) *Intermediate and Advanced Econometrics: Problems and Solutions*, 3rd edition, sections 9–13, New Economic School
- Анатолюев, С. (2003) *Курс лекций по эконометрике для подготовленных, РЭШ*
- *Квантиль*, №2, 2007. Статьи Питера Эббеса (стр. 3–20) и Александра Цыплакова (стр. 21–47). Сайт: <http://www.quantile.ru/02/N2.htm>

OPTIONAL LITERATURE

- Hayashi, F. (2000) *Econometrics*, Princeton University Press
- Baltagi, B. (1995, 2001, 2005) *Econometric Analysis of Panel Data*, John Wiley & Sons
- Hamilton, J. (1994) *Time Series Analysis*, Princeton University Press

SYLLABUS

I. Extremum Estimators and Maximum Likelihood

- Extremum estimators and their asymptotic properties. Identification conditions.
- Nonlinear Least Squares as an extremum estimator.
- Likelihood function and likelihood principle.
- Maximum Likelihood (ML) estimator as an extremum estimator.
- Consistency and asymptotic normality of ML estimators.
- When ML asymptotic theory does not work.
- Asymptotic efficiency of the ML estimator.
- Conditional, joint and marginal ML.
- ML asymptotic tests: Wald, Likelihood Ratio, Lagrange Multiplier.
- Example: binary choice models.
- ML with time series data.

II. Method of Moments

- Moment restrictions and moment functions.
- Exact identification and overidentification.
- Classical Method of Moments (CMM) and Generalized Method of Moments (GMM).
- Asymptotic properties of GMM estimators. Efficient GMM.
- GMM asymptotic tests: Wald, Distance Difference, Lagrange Multiplier.
- Test for overidentifying restrictions.
- Linear and non-linear instrumental variables regression.
- GMM and time series data.
- GMM and Rational Expectations models. Other applications leading to GMM.
- Finite sample deficiencies of GMM estimators. Modifications of the GMM estimator.
- Bootstrapping GMM.
- Hausman specification test.

III. Panel Data

- One-way and two-way error component models (ECM).
- OLS, GLS, LSDV, Within and Between estimators in one-way ECM.
- Random effects and fixed effects. Hausman test.
- Dynamic panel regression and instrumental variables estimation.
- Panel binary choice models: random effects probit and fixed effects logit.