Econometrics 1

Module 3, 2020-2021 Instructor:

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Course information

Course Website: my.nes.ru

Instructor's Office Hours: by appointment; walk-ins welcome

Class Time: TBA

Room Number: TBA

TAs: TBA

Course description

The objective of the course is to familiarize students with basic concepts of econometric analysis. During the course students learn how to apply basic econometric models to cross-sectional data. Also the participants of the course will study basic commands in R software and will do practical exercises.

Course requirements, grading, and attendance policies

Students are assumed to have sufficient background in statistics, calculus and matrix algebra. There are 14 lectures and 7 seminars. During first six weeks each week a problem set will be distributed. Best 5 problem sets will be counted for 20% of the final grade. The 3-hour-long final written format A4 exam will give 80% of the final grade.

Course contents

Week 1: Introduction. Simple regression model. Ordinary least squares. (Ch. 1,2).

Week 2: Multiple regression analysis: Goodness of fit. Irrelevant variables. Omitted variable bias. Multicollinearity. Misspecified models. Gauss-Markov theorem. (Ch. 3).

Week 3: Multiple regression analysis: Testing hypotheses. Confidence intervals. Testing multiple linear restrictions. F and t statistics. (Ch. 4).

Week 4: Multiple regression analysis: Consistency. Asymptotic normality. Asymptotic efficiency. Langrange multiplier statistic. (Ch. 5).

Week 5: Multiple regression analysis: Goodness of fit and selection of regressors. Prediction. Dummy variables. Linear probability model. (Ch. 6,7).

Week 6: Heteroskedasticity. Testing for heteroskedasticity. White test. Generalized least squares. Functional form misspecification. Proxy variables. Measurement error. Missing data. (Ch. 8,9).

Week 7: Maximum Likelihood estimation in linear regression. Instrumental variables estimation and two stage least squares. Simultaneous equations models. (Ch. 15,16).

Sample tasks for course evaluation

Problem 1. Consider the standard simple linear regression model under the Gauss-Markov assumptions. When n=3, is it possible that the data point with maximal value of dependent variable is located below the regression line? If answer is yes, provide an example, if, no, provide a proof.

Problem 2. Consider the simple linear regression model. The independent variable is endogenous and positively correlated with error term.

(a) We estimate the value of $\beta_0 + \beta_1 E[x]$ as $b_0 + b_1$[sample mean of x], where b_0 and b_1 are OLS estimates. Compute the sign of the asymptotic bias.

(b) Suppose you know that corr(x,u)=1 and all random variables are normally distributed. Can you provide asymptotically consistent estimate for β_1?

Problem 3. Consider the following nonlinear econometric model $y = A \exp\{x\} + \varepsilon^2$.
Random variable x is normally distributed with zero mean and unit variance. Random variable ε is independent of x and is distributed normally with zero mean and variance $\sigma^2 > 0$. Parameter A is positive. The random sample of size n is collected. Some econometrician decided to work with the linear model of the form $y = \alpha + \beta x + u$, where the restriction E[u]=0 is imposed.

(a) Write down the likelihood function for the nonlinear model.

(b) Is the variable x endogenous in the linear model? Provide a detailed explanation.

(c) Do we have heteroskedasticity in the linear model? Provide a detailed explanation.

(d) Let b be the OLS estimate of β in the linear model. Derive formula for plim b in terms of integrals of known functions (do not simplify the formula you get).

Course materials

Required textbooks and materials

Wooldridge, J.M., *Introductory Econometrics: A Modern Approach* (6th edition), South-Western Cengage Learning, 2016.

Additional materials

Angrist, J.D., and J.-S. Pischke, *Mostly Harmless Econometrics: An Empiricist's Companion*, Princeton University Press, 2009.

Heiss, F., Using R for Introductory Econometrics, http://www.urfie.net

Academic integrity policy

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

Heiss, F., Using R for Introductory Econometrics, http://www.urfie.net