NEW ECONOMIC SCHOOL
Master of Arts in Economics

Econometrics 1

Module 3, 2023-2024

12 January 2024

Instructor: Konstantin Styrin

kstyrin@nes.ru

Course information

Course Website: my.nes.ru

Instructor's Office Hours: Fridays 15:30-17:30

Class Time: Fridays 11:45-13:15 and 13:45-15:15

Room Number: 427

TAs: Sergey Postnov demigod0999@gmail.com, Egor Selenov eselenov@nes.ru

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 30% of the final grade. The 3-hour-long final written format A4 exam will give 70% of the final grade.

Course contents

Week 1: Introduction. Conditional expectation function vs. best linear predictor. 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. Heteroskedasticity-robust inference. Functional form misspecification. Proxy variables. Measurement error. Missing data. (Ch. 8, 9)

Week 7: Regression analysis with time-series data. Stationarity. Forecasting using AR and ADL models. Estimation of dynamic causal effects. Heteroskedasticity-and-autocorrelation–consistent (HAC) standard errors. (Ch. 10, 11, 12, 18)

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. (Y_i, X_{1i}, X_{2i}) satisfy the four least squares assumptions for causal inference in the multiple
regression model that we discussed in class; in addition, $var(u_i|X_{1i},X_{2i}) = 4$ and $var(X_{1i}) = 6$. A random sample of size n = 400 is drawn from the population.

(a) Assume that X_1 and X_2 are uncorrelated. Compute the (asymptotic unconditional) variance of the OLS estimate of β_1.

(b) Assume that $corr(X_1,X_2) = 0.5$. Compute the (asymptotic unconditional) variance of the OLS estimate of β_1.

(c) Comment on the following statements: "When X_1 and X_2 are correlated, the variance of the OLS estimate of β_1 is larger than it would be if X_1 and X_2 were uncorrelated. Thus, if you are interested in β_1, it is best to leave X_2 out of the regression if it is correlated with X_1."

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.