

Statistics and Introductory Econometrics

This course is intended to serve as an introduction to mathematical statistics and basic econometrics to first year masters students. The course is divided into two parts: part I will introduce students to the basic statistical tools used in econometrics. Part II focuses on estimation and inference of linear regression models in a world of cross-sectional data. The course is largely self-contained; no prior knowledge of econometrics is required. Some knowledge of calculus is desirable for a better understanding of the material presented. Therefore, bridge classes shall be scheduled for students not familiar with these concepts.

Section I: Statistics

Topic 1: Introduction to Probability Theory: Experiments and Events, Set Theory, Finite Sample Spaces, Counting and Combinatorial Methods, Conditional Probability, Independent Events, The Bayes Theorem.

Topic 2: Random Variables and Distributions: Discrete and Continuous Random Variables, Distribution and Density Functions, Bivariate Distributions, Multivariate Distributions, Conditional and Marginal Distributions, Functions of Random Variables.

Topic 3: The Expectations Operator: Properties of Expectations, Variance, Covariance and Correlation, the Moment Generating Function, Conditional Expectations, The Law of Iterated Expectations.

Topic 4: Some Special Distributions: The Bernoulli and Binomial Distributions, Poisson Distributions, Normal, Gamma and the Bivariate Normal Distributions.

Topic 5: Statistical Estimation and Inference with Large Random Samples: Limit Theorems (The Law of Large Numbers, Lindberg-Levy Central Limit Theorem), Sampling Distributions (the t, F and Chi- Squared Distributions).

Section II: Introduction to Basic Econometrics

Topic 1: Regression models (Simple and Multivariate), properties of OLS estimator, interpretation of coefficients, Gauss-Markov Theorem.

Topic 2: Inference, Hypothesis Testing, and Confidence Interval Approach.

Topic 3: Large Sample Properties of the OLS Estimator, consistency of the OLS coefficients, Asymptotic Variances of the estimators.

Topic 4: Violation of OLS Assumptions: Heteroscedasticity, constancy, Omitted Variable Bias, Measurement Error etc.

Topic 5: Regression Analysis using Matrices.

Core Texts For the Course:

Degroot, M.H. and Schrvisch, M.J., *Probability and Statistics*, Fourth Edition, Addison-Wesley, 2012

Jeffrey M. Wooldridge, *Econometrics*, Indian Edition, Cengage Learning, 2009.

Supplementary Readings:

Hogg, R., McKean, J., Craig, A.T., *Introduction to Mathematical Statistics*, Seventh Edition, Pearson Education, 2014

Hoel, P.G., Port, S.C., Stone, C.J., *Introduction to Probability Theory*, Cengage Learning, 1971.

Christopher Dougherty, *Introduction to Econometrics*, 4th edition, OUP, Indian edition.

G.S. Maddala, *Introduction to Econometrics*, 3rd Edition, Wiley India.

For Stata,

Colin Cameron and Pravin Trivedi, *Microeconometrics Using Stata*, Revised Edition, Stata Press.