Statistical Methods for Economics
Ph. D in Economics
Department of Economics
Roma Tre University

Syllabus

Econometrics A. Naccarato
The k-Variable linear equation
Matrix formulation of the k-variable Model, Partial Correlation Coefficient, The Geometry of Least Squares, Inference in the k-Variable Equation, Restricted and unrestricted regression, Prediction.
Some tests of the k-variable linear equation for specification error
Specification error, Model evaluation and diagnostic tests, Test of parameter constancy, Tests of Structural change, Dummy variables.
Maximum Likelihood (ML), Generalized Least Squares (GLS), and Instrumental Variable (IV) estimators
Maximum Likelihood estimation of the linear model, Likelihood Ratio, Wald and Lagrange Multiplier Tests, Maximum Likelihood estimation of the linear model with nonspherical disturbances, Instrumental Variables estimators (Two-stage Least Squares, choice of Instruments, Test of linear restrictions).
Heteroskedasticity and Autocorrelation
Tests of heteroscedasticity, Estimation under heteroscedasticity, Autocorrelated disturbances, Tests for autocorrelated disturbances, Estimation of relationships with autocorrelated disturbances, Forecasting with autocorrelated disturbances.
Simultaneous Equation Models
The Model, Assumptions on error components and parameters' estimation (SEM).
Seemingly Unrelated (SUR): The Model, Estimation problems and Empirical Generalized Least Squares (EGLS). Conditions for OLS consistency, Structural and Reduced Form equations, Identification and structural parameters, Rank and order conditions for structural parameters identification. Consequences of order conditions, Exact identification: Indirect Least Squares Estimators (ILS), Over identification: Limited and Full Information methods.
Time Series Analysis
First-Order Difference Equations, pth-Order Difference Equations, Lag Operators, Stationary ARMA Processes, Forecasting, Maximum Likelihood Estimation, Introduction to multiple time series analysis, VAR model.

Panel data models
Advantages of panel data, Fixed effects models: least square dummy-variable approach, Random effect models: estimation of variance-components models, Models with specific variables and both Individual and Time-specific Effects.

Suggested Books
Greene W. H. (2003), *Econometric Analysis*, 5th Edition, Prentice Hall.
Hamilton J. D. (1994), *Time Series Analysis*, Ed. Princeton.
Lütkepohl H. (2005), *New Introduction to Multiple Time Series Analysis*, Springer.
Magnus J. R., Neudecker H. (2019), *Matrix Differential Calculus with applications in statistics and econometrics*, 3th Edition, John Wiley & Sons.
Wooldridge J. M. (2002), *Econometric Analysis of Cross Section and Panel Data*, MIT Press