M Phil Econometrics

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Estimation and Inference in Linear Models

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Outline

These lectures will cover estimation and hypothesis testing in simple linear models.

We start with classical linear regression models, for which exact distribution results are available, introducing the OLS estimator and related t-tests and F-tests of linear restrictions. Key assumptions are linear conditional expectation functions (strictly exogenous explanatory variables) and conditional homoskedasticity.

We then consider asymptotic distribution results for the OLS estimator, and related asymptotic t-tests and χ^2-tests of linear restrictions, which can be derived under weaker assumptions.

Estimation and inference will then be discussed for models with conditional heteroskedasticity. This will cover the 'passive' approach (asymptotically robust inference based on the OLS estimator), and the 'active' approach (obtaining more efficient estimators (GLS, FGLS, ML) by modelling the form of heteroskedasticity).

We will then discuss estimation and inference for linear models with endogenous explanatory variables, which may reflect measurement error, omitted variables, or simultaneity. This will introduce IV, 2SLS and GMM estimators.

The application of these methods will be illustrated, introducing the basic commands for OLS and IV estimation in the STATA package.

If time allows, we will cover testing in the ML framework in more detail (Wald, LR and LM tests), and briefly introduce some issues that are relevant for time series data (lagged dependent variables, serial correlation).

Reading suggestions

Treatments can be found in most graduate econometrics textbooks, including:

F. Hayashi (2000), *Econometrics*, Princeton University Press, esp Chapters 1-3

A.C. Cameron and P.K. Trivedi (2005), *Microeconometrics*, Cambridge University Press, esp Chapters 2 and 4-7

R. Davidson and J.G. MacKinnon (2003), *Econometric Theory and Methods*, Oxford University Press, esp Chapters 1-5 and 8-9

W.H. Greene (2011), *Econometric Analysis*, 7th ed, Pearson Education, esp Chapters 1-5, 8-9 and 12-14

Another useful reference, particularly for the material on IV, is

J.M. Wooldridge (2010), *Econometric Analysis of Cross Section and Panel Data*, 2nd ed, MIT Press, esp Chapters 4-5