EC 421

Midterm Topics

Spring 2021

Note: In general, you do not need to memorize proofs. Just understand the steps and intuitively get a grasp on how they might be used to inform results. I might ask how you get from one step to the next, or at most 2 steps from where we begin. I won't ask you to write down a full proof - that's not helpful for you or I.

Slides 1: Intro

- The goal of econometrics
- Regression notation
- Basic concept of causality

Slides 2: Review I

- Population vs. sample
    - Parameters vs. sample estimates
    - Estimators and uncertainty
- Uncertainty
    - Standard errors
    - Hypothesis testing
    - *t* tests
    - *F* tests
    - Forming hypotheses
    - critical value
    - *p*-value
    - Confidence intervals
- Linear regression and OLS
    - "Best-fit" line
    - Residuals
    - SSE
    - Estimators: bias and variance
    - Statistical inference
    - Variance (and standard error) of the OLS estimator
    - Regressions with R's `lm` function

Slides 3: Review II

- Simple and multiple linear regression
- Model fit
    - R squared
    - Overfitting/R squared mechanically increases
    - Adjusted R squared
- Omitted-variable bias
- Interpreting coefficients
    - Simple linear regression
    - Multiple linear regression (ceterus paribus)
    - Continuous explanatory variables
    - Categorical explanatory variables
    - Interactions
    - Specifications
    - Linear-linear
    - Log-linear
    - Log-log
- Inference vs. prediction

Slides 4: Heteroskedasticity

- The meaning of each of our assumptions/requirements
- Heteroskedasticity
    - What it is
    - What it looks like
    - Consequences for OLS
- Tests for heteroskedasticity
    - Goldfeld-Quandt test
    - Breusch-Pagan test
    - White test
    - Chi-squared distribution
    - Null and alternative hypotheses of each test
    - Interpretations/conclusions for each
    - Strengths and weaknesses of each test

Slides 5: Living with Heteroskedasticity

- Misspecification
- Weighted least squares and FGLS
- Heteroskedasticity-robust standard errors

Slides 6: Asymptotics and Consistency

- Asymptotics
    - Compared to 'finite-sample' attributes (probability limits vs. expected values)
    - Probability limits
- Consistency (vs. Bias)
- Signing the direction of inconsistency from omitted variables.
- Measurement error and attenuation bias: What are they?
- Examples of measurement error

Slides 7: Time Series

- Basics of time-series data: How do they differ from cross-sectional data?
- Static models *vs.* dynamic models
- How do we specify time series models?
- How do we estimate 'persistence' effects using time series tools?