

Econometrics 710
Midterm Exam
March 11, 2010

1. An economist friend tells you that the assumption that the observations (y_i, \mathbf{x}_i) are iid implies that the regression $y_i = \mathbf{x}'_i \boldsymbol{\beta} + e_i$ is homoskedastic. Do you agree with your friend? How would you explain your position?
2. You estimate a least-squares regression

$$y_i = \mathbf{x}'_{1i} \tilde{\boldsymbol{\beta}}_1 + \tilde{u}_i$$

and then regress the residuals on another set of regressors

$$\tilde{u}_i = \mathbf{x}'_{2i} \tilde{\boldsymbol{\beta}}_2 + \tilde{e}_i$$

Does this second regression give you the same estimated coefficients as from estimation of a least-squares regression on both set of regressors?

$$y_i = \mathbf{x}'_{1i} \hat{\boldsymbol{\beta}}_1 + \mathbf{x}'_{2i} \hat{\boldsymbol{\beta}}_2 + \hat{e}_i$$

In other words, is it true that $\tilde{\boldsymbol{\beta}}_2 = \hat{\boldsymbol{\beta}}_2$? Explain your reasoning.

3. Out of an iid sample (y_i, \mathbf{x}_i) of size n , you randomly take half the observations and estimate the least-squares regression of y_i on \mathbf{x}_i using only this sub-sample.

$$y_i = \mathbf{x}'_i \hat{\boldsymbol{\beta}} + \hat{e}_i$$

Is the estimated slope coefficient $\hat{\boldsymbol{\beta}}$ consistent for the population projection coefficient? Explain your reasoning.

4. You have two regressors x_1 and x_2 , and estimate a regression with all quadratic terms

$$y_i = \alpha + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{1i}^2 + \beta_4 x_{2i}^2 + \beta_5 x_{1i} x_{2i} + e_i$$

One of your advisors asks: Can we exclude the variable x_{2i} from this regression?

How do you translate this question into a statistical test? When answering these questions, be specific, not general.

- (a) What is the relevant null and alternative hypotheses?
- (b) What is an appropriate test statistic? Be specific.
- (c) What is the appropriate asymptotic distribution for the statistic? Be specific.
- (d) What is the rule for acceptance/rejection of the null hypothesis?