

Econometrics 710
 Midterm Exam
 March 21, 2002

1. The model is iid data, $i = 1, \dots, n$,

$$y_i = x_i' \beta + e_i$$

$$E(e_i | x_i) = 0$$

Does the presence of heteroskedasticity invalidate the application of the non-parametric bootstrap? Explain briefly.

2. The model is

$$Y = Z\beta + e$$

$$Z = X\Gamma$$

$$E(e | X) = 0$$

where X is $n \times k$, Γ is $k \times m$, $k > m$, β is $m \times 1$. Suppose that Γ is unknown, but it is estimated by $\hat{\Gamma}$ which satisfies

$$\hat{\Gamma} \rightarrow_p \Gamma.$$

Assume that Γ has full rank m and that $\beta = 0$ (Hint: both are important). Set $\hat{Z} = X\hat{\Gamma}$, and let $\hat{\beta} = \hat{Z}'\hat{Z}^{-1}\hat{Z}'Y$. Derive the asymptotic distribution of $\sqrt{n}\hat{\beta}$.

3. The model is iid data, $i = 1, \dots, n$,

$$y_i = x_i' \beta + e_i$$

$$E(e_i | x_i) = 0$$

Let $\hat{\beta}$ be the OLS estimator of β , and let \hat{V}_n be the White covariance matrix estimator of $V_n = \text{Var}(\hat{\beta})$. Suppose that in addition to the above model assumptions, it is true that

$$E(e_i^2 | x_i) = \sigma^2.$$

Under these conditions, find $E(\hat{V}_n | X)$.

Hint: First find $E(\hat{e}_i^2 | X)$, where \hat{e}_i is the OLS residual. In particular, show that

$$E(\hat{e}_i^2 | X) = \sigma \lambda_i$$

where λ_i is specific function of x_i and $(X'X)^{-1}$.