

Week 8 Problems Notes

Heteroskedasticity Problems

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- For variance regression test, we have that for a test with S regressors,

$$N \times R^2 \sim \chi^2_{(S-1)}$$

- This is a large sample test under the null hypothesis that all other coefficients are 0
 - Also referred to as Lagrange Multiplier Test or Breusch Pagan Test.
 - If we do this using the x 's and squares of x 's and possible cross product, call it the white test
- Generalized least squares estimator for β depends on the unknown σ_i^2 . Want to minimize the loss function.
 - To do this, we will need to specify a form for the variance. For example, we would say that $\sigma_i^2 = \sigma^2 x_i$. Then we divide everything by \sqrt{x} and we'll see that our new model has the same beta's but is homoskedastic.
 - New transformed constant term is not a constant, so keep in mind
 - Once we do this, estimate with least squares
 - In generalized least squares, we may not know the form of the variance. We could generalize this and say that

$$\sigma_i^2 = \sigma^2 x_i^\gamma$$

From here we would normalize by dividing all our variables by $x^{\gamma/2}$

- Now what remains is to estimate γ . We may follow similar steps as in variance regression above
- Taking logs:

$$\ln(\sigma_i^2) = \ln(\sigma^2) + \gamma \ln(x_i)$$

- γ can then be estimated by least squares, regressing $\ln(\sigma_i^2)$ against $\ln(x_i)$.