BA-BMECV2502U Econometrics

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Problem Set 2: OLS: topics

1. Which of the following are consequences of heteroskedasticity?
   (a) The OLS estimators, $\hat{\beta}_j$ are inconsistent.
   (b) The usual F statistic no longer has an F distribution.
   (c) The OLS estimators are no longer BLUE.
2. Consider a linear model to explain monthly beer consumption:

$$beer = \beta_0 + \beta_1 inc + \beta_2 price + \beta_3 educ + \beta_4 female + u$$

with

$$\begin{aligned} E(u|inc, price, educ, female) &= 0 \\ Var(u|inc, price, educ, female) &= \sigma^2 inc^2 \end{aligned}$$

Write the transformed equation that has a homoskedastic error term.

3. True or False: WLS is preferred to OLS when an important variable has been omitted from the model.

4. Use the data hprice1.dta and consider the house price equation

$$log(price) = \beta_0 + \beta_1 log(lotsize) + \beta_2 log(sqrft) + \beta_3 bdrms + u.$$

   (a) Estimate the model by OLS and compare the usual standard errors and heteroscedasticity robust standard errors.

   (b) Apply the full White test for heteroscedasticity. Using the F test form of the statistic, obtain the p-value. What do you conclude?

5. In the lecture, we computed the OLS and FGLS estimates in a cigarette demand equation (SMOKE.dta).

   (a) Obtain the OLS estimates for this model.

   (b) Obtain the $\hat{\omega}_i$ used in the feasible GLS estimation of the equation in the example and reproduce the results of the FGLS estimation. From this equation, obtain the unweighted residuals and fitted values; call these $\hat{u}_i$ and $\hat{y}_i$, respectively.

   (c) Let $\breve{u}_i = \hat{u}_i/\sqrt{\hat{\omega}_i}$ and $\breve{y}_i = \hat{y}_i/\sqrt{\hat{\omega}_i}$ be the weighted quantities. Carry out the special case of the White test for heteroskedasticity by regressing $\breve{u}_i^2$ on $\breve{y}_i$ and $\breve{y}_i^2$, being sure to include an intercept, as always. Do you find heteroskedasticity in the weighted residuals?

   (d) What does the finding from part (c) imply about the proposed form of heteroskedasticity used in obtaining the FGLS estimates of part (b)?

These problems have been partly taken from the textbook "Introductory Econometrics" by J.Wooldridge, 7th edition, 2020.