Econometrics
Lecture 5: Heteroskedasticity

File "food.data" contains the following variables:

- y: food expenditure;
- x: income.

Consider the following model:

$$y_i = \beta_1 + \beta_2 x_i + \epsilon_i \tag{1}$$

Question 1 Estimate the model (1) by standard OLS model. Check with a White test if heteroskedasticity is eliminated.

Questions 2-5 Estimate the model (1) by GLS (WLS) under the following assumptions:

1. $Var(\epsilon_i) = \sigma^2 x_i$;
2. $Var(\epsilon_i) = \sigma^2 \sqrt{x_i}$;
3. $Var(\epsilon_i) = \sigma^2 x_i^2$;
4. $Var(\epsilon_i) = \sigma^2 log(x_i)$;

Can you notice any difference in estimated β_2 magnitude? Is the parameter statistically significant? Check with a White test if heteroskedasticity is eliminated.

Question 6 Consider the following case:

$$\sigma_i^2 = exp(a_1 + a_2 z_i)$$

where z_i is $log(x_1)$. Estimate model (1) by FGLS.

Hint:

i. Estimate model (1) by OLS;

ii. Store the residuals and create $log(\hat{\epsilon}^2)$;

iii. Create a new variable $log(x_i)$;

iv. Regress $log(\hat{\epsilon}^2)$ onto a constant and $log(x_i)$ and store the fitted values;

v. Create a new variable $w_4 = \frac{1}{exp(\hat{a_1} + \hat{a_2} z_i)}$;

vi. Estimate model (1) using w_4 as a weighted variable (by WLS).

Notes by Andrea Perchiazzo. Thanks to professor Andrea Monticini.