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Midterm Practice Problems

Derive an LM test statistic (and state its distribution) for the null
$H_0: \ \alpha = 1 \qquad H_1: \ \alpha \neq 1$

$$Y_t = \beta \left(\frac{1}{R_t}\right)^{2\alpha} + \epsilon_t, \qquad \begin{array}{c} R_t weaklyexogenous \\ \epsilon_t \sim iidN(0,\sigma^2). \end{array}$$

2. Outline all the steps involved in estimating

$$\Theta = \left\{\sigma^2, c, \rho_1, \rho_2\right\} \text{ using conditional ML}$$

where

$$Y_t = c + \rho_1 \ \epsilon_{t-1} + \rho_2 \ \epsilon_{t-2} + \epsilon_t$$

$$\epsilon_t \sim \text{iid N}(0, \sigma^2)$$

3. Outline the procedure involved in testing for ARCH using the LM test approach.

4. Write down the general form of the LR, LM, and Wald test statistics, and compare them.

5. Discuss and contrast LS, GLS, and IV estimators, and which assumptions are relaxed in each case. Also, write and compare the estimators in all of these cases.

6. Show that running a regression of y_2 and y_1 does not yield the reciprocal estimator of β when y_1 is run on y_2 (using LS), given that

$$\begin{array}{c} y_{1t} = \beta y_{2t} + \epsilon_{1t} \\ y_{2t} = \epsilon_{2t} \end{array} \qquad \begin{pmatrix} \epsilon_{1t} \\ \epsilon_{2t} \end{pmatrix} \sim \epsilon \left(0 \begin{pmatrix} \sigma_{11} & \sigma_{12} \\ \sigma_{12} & \sigma_{22} \end{pmatrix} \right)$$

Under what additional assumptions is

1. (a) y_2 w.e. for β
   (b) y_1 w.e. for β (w.e. means weakly exogenous)

Do these assumptions make sense?