

ECONOMETRICS I, SPRING 2017.

**Homework 10. Due Wednesday April 26.**

1. You want to estimate the model

$$y_i = \alpha_0 + \alpha_1 x_i + e_i$$

by maximum likelihood. Assume that the variance of the error term is  $\text{var}(e_i) = \gamma x_i^2$ .

- a) Derive the maximum likelihood estimators for  $\alpha_1$  and  $\gamma$ .
- b) Find the asymptotic variance matrix using the information matrix.

2. Assume that you have  $N$  observations from an exponential distribution with mean  $\frac{1}{\theta}$ .

- a) Derive the maximum likelihood estimators for  $\theta$ .
- b) Find the asymptotic variance matrix using the information matrix.

3. Computer question (continuation of previous homeworks). Assume that you are told that the variance of the residuals is proportional to the square of the interest rates.

- a) Estimate the relation using Maximum Likelihood.
- b) Estimate the variance using the information matrix. (You can evaluate it numerically. Extra points for doing it numerically *and* finding it analytically.)
- c) How do the results compare to 2-stage GLS?