Econ 7331
Econometrics 1
Spring 2009

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Problem Set 5

Due Thursday, April 14, in class

1. Suppose you have data which are *iid* Poisson(λ). That is,

$$f(x_i) = \frac{e^{-\lambda}\lambda^{x_i}}{x_i!}$$

where $x = 0, 1, \ldots$, $E(X_i) = \lambda$, and $\text{var}(X_i) = \lambda$.

a. Derive the log likelihood function.
b. Find the maximum likelihood estimator of λ, denoted $\hat{\lambda}_{MLE}$.
c. Derive the Cramér-Rao lower bound for unbiased estimators of λ. Does $\hat{\lambda}_{MLE}$ achieve the Cramér-Rao lower bound?

2. Suppose you have data, which are *iid* exponential. That is

$$f(z_i;\theta) = \frac{1}{\theta} e^{-z_i/\theta}$$

where $0 \le z_i < \infty$, and $\theta > 0$. Also, $E(z_i) = \theta$ and $\text{var}(z_i) = \theta^2$.

a. Derive the log likelihood function.
b. Derive the maximum likelihood estimator of θ, $\hat{\theta}_{MLE}$. Is $\hat{\theta}_{MLE}$ unbiased?
c. Derive the Cramér-Rao lower bound for unbiased estimators of θ. Does $\hat{\theta}_{MLE}$ achieve the Cramér-Rao lower bound?

3. Consider the regression model $y = X\beta + u$, where $u \sim (0, \sigma^2\Sigma)$ and Σ is known.

   Prove that σ^2_{GLS} is unbiased, and σ^2_{OLS} is biased.

4. Redo question 3 from the midterm, in Eviews, using midterm.wf1.