Economics 671: Applied Econometrics
Department of Economics, Finance and Legal Studies
University of Alabama
Fall 2016

Midterm

1. Consider the gamma pdf where a is given

$$f_Y(y) = \frac{y^{a-1}\exp\left(-\frac{ya}{\mu}\right)}{\Gamma(a)\left(\frac{\mu}{a}\right)^a}$$

   (a) Show that this can be written in the LEF form as $f_Y(y) = \exp\{a(\mu) + b(y) + c(\mu)y\}$.
   (b) Assuming that $\mu = \exp(x\beta)$, what is the equivalent objective function that we maximize?
   (c) Give the first order conditions.
   (d) Give the second order conditions.
   (e) Will we achieve a unique solution given any starting value for the parameters? How do you know this?

2. Consider the linear model

$$y_i = x_i\beta + u_i$$

   where $E(u|x) \neq 0$, but there exists a vector of variables z such that $E(u|z) = 0$. Using the moment condition $E(zu) = 0$

   (a) Give the objection function.
   (b) Give the first order conditions.
   (c) Derive the explicit solution for $\widehat{\beta}_{GMM}$.

3. Consider the gravity equation discussed in Santos-Silva and Tenreyro (2006)

$$T_{ij} = \alpha_0 Y_i^{\alpha_1} Y_j^{\alpha_2} D_{ij}^{\alpha_3}\varepsilon_{ij}, \quad i = 1, 2, \ldots, n, \quad j = 1, 2, \ldots, n$$

   (a) What does each variable represent?
   (b) Discuss the meaning of the parameters? What is the expected sign of each parameter?
   (c) Write the conditional expectation $(E(T_{ij}|Y_i, Y_j, D_{ij}))$ as an exponential function.
   (d) Estimation can be performed by using the Poisson density

$$f(T|\theta) = \frac{\exp(-\theta)\theta^T}{T!},$$

   where θ is the result form part (c). Write the log-likelihood function and take the first-order conditions.