

# Homework

Econometrics

April 17, 2017

## General Instructions

You may turn in your answers in the form of annotated notes made on your output. Otherwise, make sure your results and answers are easy to identify and supported by relevant programs and output. In order to obtain credit for the exercises you must turn in both the programs and output.

## Problem

Using the *ces.gdt* data set available from my website complete the following exercises using gretl.

The constant elasticity of substitution production function is

$$\ln(y) = \ln(\gamma) - \frac{\nu}{\rho} \ln[\delta K^{-\rho} + (1 - \delta)L^{-\rho}] + u \quad (1)$$

where  $y$  = output,  $K$  is capital and  $L$  is labor. Assume the errors,  $u$ , are  $iid(0, \sigma^2)$ . There are at least two ways to estimate the parameters of this model: Use ordinary least squares to estimate a linear approximation (and use the Delta method to get the standard errors) or use nonlinear least squares. In this exercise you'll do both. The linear approximation to this function [see e.g., Greene (2000, p. 331)] is

$$\ln(y) = \ln(\gamma) + \nu\delta \ln(K) + \nu(1 - \delta) \ln(L) + \rho\nu\delta(1 - \delta) \left\{ -\frac{1}{2} \ln^2(K/L) \right\} + u \quad (2)$$

1. Estimate (2) using ordinary least squares (e.g.  $\beta_2 = \nu\delta$ ) and solve for the parameters  $\gamma$ ,  $\nu$ ,  $\delta$ , and  $\rho$  in terms of the estimated  $\beta$ s. Use the Delta Method to estimate the covariance matrix so that you obtain consistent estimates of the standard errors. Report your estimates, standard errors and asymptotic t-ratios.
2. Now, use nonlinear least squares to estimate (1). Again, report estimates, standard errors and t-ratios.

## References

Greene, William H. (2000), *Econometric Analysis*, 4th edn, Prentice-Hall.