Macroeconomics II
Assignment 2

1. Assume $Y(t) = F(B(t)K(t), A(t)L(t))$, where $B(t) = e^{zt}$ and $A(t) = e^{xt}$. Prove that if $z \neq x$ the only production function that yields a steady state with constant income growth is Cobb-Douglas.

The remaining questions are based on Mankiw Romer and Weil (1992). Their data set, which covers the period 1960-1985, is available in an excel file from the course web page.

2. MRW give the following equation (13) for the speed of convergence:

$$\frac{d \ln y(t)}{dt} = (n + g + \delta)(1 - \alpha - \beta)\left(\ln y^* - \ln y(t)\right)$$

Derive this equation formally.

3. Replicate the results of Table II in MRW. For each of their three samples, estimate their equation (12) by nonlinear least squares to get direct estimates of α and β along with standard errors.

4. One criticism of MRW is that their regressions assume that technology, *A*, is identical for all countries. This question asks you to explore the consequences of this assumption if it is false.

(a) Assume that $\alpha = \beta = 1/3$, and that $g + \delta = 0.05$. Construct an estimate of *A* for each country. What are the relationships between *A* and the variables s_h, s_k, and *n* (you may regress *A* on these regressors)? Do these relationships make economic or intuitive sense?

(b) *A Monte Carlo exercise.* Construct an artificial data set with 100 observations, which contains random values for s_h and s_k. For each observation generate (i) a purely random value for *A*, and (ii) a random value for *A* that is positively correlated with s_h, s_k, and negatively correlated with *n*. For each of these, generate an observation for *y* assuming the human-capital augmented model is true, that $\alpha = \beta = 1/3$ and $g + \delta = 0.05$. You should add a random disturbance with zero mean and a reasonable amount of variance to *y* (what would be a reasonable amount of variance?). Now run the restricted MRW regression from Table II for each case (i) and (ii). **Repeat this exercise 1,000 times.** What are the properties of your implied estimates for α and β?