

UNIVERSITAT POMPEU FABRA

APPLIED MACROECONOMICS

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Problem Set 1

Due: 11/10/04

1. In the context of the Solow-Swan model suppose that the production function is Cobb-Douglas.

a) Find the expressions for k^* , y^* and c^* as a function of the parameters of the model $(\delta, \alpha, g, n, s)$.

b) What is the Golden Rule value of k ?

c) What savings rate is needed to yield the golden rule capital stock?

2. Suppose that investment as a fraction of output in the United States rises permanently from 0.15 to 0.18. Assume that capital's share is $1/3$.

a) By about how much does output eventually rise relative to what it would have been without the rise in investment?

b) By about how much does consumption rise relative to what it would have been without the rise in investment?

3. As we argued in class technological progress must be labor augmenting in order for the Solow model to have a steady state with constant growth rates. However if the production function is Cobb-Douglas then a steady state exists even if technological progress is capital augmenting. As an exercise show that the economy converges to a balance growth path and find the growth rates of Y and K on the balance growth path if the production function is a Cobb-Douglas with capital augmenting technological progress

$$Y = [AK]^\alpha L^{1-\alpha}$$
$$A = A_0 e^{gt}$$

(Hint: Work with the ratio $Y/(A^\mu L)$ as a function of $K/(A^\mu L)$, where $\mu = \alpha/(1 - \alpha)$).

4. Imagine that the production function is $Y = AK$ instead of a Cobb-Douglas. To simplify assume that A is constant (technological progress is zero).

a) Which of the assumptions we consider in class with respect to the production function is violated by this formulation?

b) Can it be long run growth even without exogeneous technological progress ($g=0$)? If so, what parameters determine the growth rate of the economy?

c) Do economies converge in this kind of model? Discuss.

5. Mankiw, Romer and Weil run a set of regressions to validate their interpretation of the Solow growth model (*Quarterly Journal of Economics*, 1992). The dataset is included in ascii (free) format in the file *mrw.prn*. There are 121 countries and 9 explanatory variables. Each column is an explanatory variable. The first column correspond to the id number for the country; the second is a dummy variable that takes value 1 if the country belong to the intermediate group and 0 otherwise. The third column is a dummy variable that takes value 1 if the country belong to the OCDE and 0 otherwise. Forth column contains the output per capita in the initial year (1960). The fifth is the per capita output in the final year (1985). The sixth contains the growth rate of output per capita between 1960 and 1985. The seventh is the average growth rate of population during the period 1960-85. The eight column contains the average savings rate over the period and the last column correspond to the human capital variable “ average percentage of working age population with secondary education”.

a) Replicate the results in tables 1 and 2 of Mankiw, Romer and Weil (1992).

b) Explain and perform the tests implied by the theory.

c) Azariadis and Drazen (*Quarterly Journal of Economics*, 1990) have argued that there may exist human capital accumulation thresholds, which identify shifts in aggregate technology. Therefore, it may be the case that countries with a level of human capital higher than a threshold value have a convergence behavior different from the rest of the countries. Divide the countries in two groups: one with countries with human capital above the average of all the countries and the other with the rest. Test the constancy of the parameters for both subsamples. Explain.