Problem set 1

November 11, 2011

Exercise 1 (Romer, 1.2)

Suppose that the growth rate of some variable, X, is constant and equal to $a > 0$ from time $t = 0$ to $t = t_1$; drops to 0 at time t_1; rises gradually from 0 to a from time t_1 to t_2; and is constant and equal to a after t_2.

1. Sketch a graph of the growth rate of X as a function of time.
2. Sketch a graph of $\log X$ as a function of time

Exercise 2 (Romer, 1.5)

Consider Solow model with technological and population growth (with growth rates g and n respectively) and depreciation rate δ as we derived it in the class. Suppose $F(K, AL) = K^\alpha (AL)^{1-\alpha}$.

1. Find expressions for k^*, y^* and c^* as function of the parameters of the model s, n, g, δ and α.
2. What is the golden-rule value of k?
3. What saving rate s^* is needed to yield the golden rule capital stock?

Exercise 3

Consider Solow model with population and technological growth (n, g). Also, we know that $\delta K_{t+1} = sF(K_t, A_t L_t) + (1 - \delta K)$. In the class we have used the continuous time calculus to derive $\dot{k} = sf(k) - (n + g + \delta)k$.

Working with the discrete variables, show that

$$(1 + g + n)(k_{t+1} - k_t) = sf(k) - (n + g + \delta)k_t.$$

Exercise 4

In the framework of the dynamic model we have derived in the class, consider a simple modification by adding the government. The demand for output is hence given by private consuption and government expenditures: $Y^D = C + G$.

1. describe the intertemporal government budget constraint
2. analyze the effects of a *permanent* and a *temporary* increase of government spending.

(*hint*: How strong is the wealth effect in either case?)