UNIVERSITY OF CALIFORNIA
DEPARTMENT OF ECONOMICS

Economics 202A
Fall 2019
D. Romer

Problem Set 4
Due at the start of lecture Thursday, October 3

1. (This is different from the usual type of problem.) This problem asks you to "play around" with the model presented at the start of Section 2 of Eggertsson-Mehrotra-Robbins (equations [1]-[11], pp. 8–10). Specifically, choose some simplification, generalization, or variation of the assumptions of the model (or of the slightly simplified version of that model presented in lecture). Explain why you chose the change to the assumptions that you did. Then investigate how, if at all, your change affects the basic analysis and messages of the model, and discuss what you found.

Obviously, there is no right answer to this question. For example, if a seemingly small variation or generalization makes the model intractable, or if an apparent simplification does not make the model any easier to analyze or more transparent, or if an apparent generalization turns out not to be a generalization at all, that would be interesting to know from the perspective of model-building and of understanding the model.

Likewise, there is no right or wrong motivation for changing the model. Nonetheless, it is worth spending some time thinking about what change you want to make. Examples of potentially promising motivations are, "Looking at their analysis, it seemed to me that all that assumption xxxx did was to clutter up the presentation without generating any insights; I wanted to see if this was true"; or, "I can argue intuitively that the results would fall apart if I relaxed assumption yyyy; I wanted to see whether this was true."

2. (From an old midterm.) Consider the model of endogenous knowledge accumulation presented in the book and in lecture for the case of $\theta < 1$:

$$Y(t) = (1 - a_L)L(t)A(t), \quad 0 < a_L < 1,$$

$$\dot{A}(t) = B[a_L L(t)]^{\gamma} A(t)^{\theta}, \quad B > 0, \qquad \gamma > 0, \qquad \theta < 1.$$

$$\dot{L}(t) = nL(t).$$

Assume $L(0) > 0$, $A(0) > 0$. As in the usual model, a_L is exogenous and constant.

In contrast to the baseline version of the model, assume that the rate of population growth is a decreasing function of the fraction of workers who are engaged in R&D: $n = n(a_L),\ n'(\bullet) < 0,\ n(\bullet) > 0$. (The idea is that, for some reason, scientists on average have fewer children than other workers.)

Suppose the economy is on a balanced growth path, and that there is a permanent increase in a_L. Sketch the resulting path of $\ln A$ and what that path would have been without the increase in a_L. Explain your answer.

3. In a Diamond economy with logarithmic utility, $U_t = \ln C_{1t} + [\ln C_{2,t+1} / (1 + \rho)]$, and Cobb-Douglas production, $Y_t = K_t^\alpha (A_t L_t)^{1-\alpha}$, a rise in individuals' discount rate, ρ:

A. Shifts the locus showing k_{t+1} as a function of k_t down.
B. Shifts the locus showing k_{t+1} as a function of k_t up.
C. Does not affect the locus showing k_{t+1} as a function of k_t.
D. Has an ambiguous effect on the locus showing k_{t+1} as a function of k_t.

4. Romer, Problem 3.9. (Note: This problem related to material that will be covered in lecture on Oct. 1.)

EXTRA PROBLEMS (NOT TO BE HANDED IN; COMPLETE ANSWERS MAY NOT BE PROVIDED)

5. Consider an economy described by the Diamond overlapping-generations model where initially k is above its balanced-growth-path level. Now suppose there is an unexpected, permanent rise in agents' discount rate, ρ.

Sketch the resulting paths of k, and what that path would have been if ρ had not changed. Explain your answer.

6. Romer, Problem 3.1.

7. Romer, Problem 2.18.

8. Romer, Problem 2.20. (Note: I really like this problem.)

9. Romer, Problem 2.19.

10. Romer, Problem 2.21.

11. Romer, Problem 2.17.

12. Romer, Problem 3.5.