Exam 1. Econ520. Spring 2016

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UNC

Instructions:

- Answer all questions.

- Clearly number your answers. Write legibly.

- Do *not* write your answers on the question sheets.

- *Explain* your answers – do not just state them.

- *Show* your derivations – do not just state the final result.

- Do not refer to any notes or books. You may use a calculator.

- The total time is 75 minutes.

- The total number of points is 100.

1 Short Questions

1. [8 points] It is often said that correlation does not imply causation. This question asks you to apply this saying to a specific case.

   In the data, countries with tropical climates and thus lots of tropical diseases are typically poorer than more northern, cooler countries. Why does this not prove that climate causes cross-country income differences? Be specific.

2. [8 points] How does a non-rival input generate increasing returns to scale? Explain using a specific example.

3. In the Romer model, the production of ideas follows $\dot{A} = BL_A^{\lambda} A^{\phi}$ with $\phi < 1$.

   (a) [10 points] Derive the balanced growth rate of ideas.

   (b) [9 points] Intuitively, why does the balanced growth rate of ideas depend on the population growth rate?

2 Solow Model

Recall the key equation of the Solow model with productivity growth:

$$\dot{\bar{k}}_t = sA^{1-\alpha}\bar{k}_t^{\alpha} - (n + \delta + g(A))\bar{k}_t \tag{1}$$

where $\bar{k} = K/(AL)$.

The economy is on its balanced growth path until time $t = 0$. Consider the effects of a permanent increase in the growth rate of productivity $g(A)$ that starts at $t = 0$.

Questions:

1. [7 points] Derive the steady state value of $\bar{k}$ as a function of parameters.

2. [8 points] Plot $g(\bar{k})$ against $\bar{k}$. Explain what you draw.

3. [10 points] In your graph, show what happens over time after $g(A)$ increases. Explain.

4. [10 points] Plot the time paths of $\ln(\bar{k})$ and of $\ln(k)$. Explain.

3   IS/LM

Recall the equations of the IS/LM model:

$$IS: \ Y = C(Y - T) + I(Y, i) + G \tag{2}$$
$$LM: \ M/P = YL(i) \tag{3}$$

Suppose that financial innovation makes the demand for money more interest elastic (L responds more to changes in i).

Questions:

1. [10 points] How does this affect the slope of the LM curve? Explain the intuition.

2. [20 points] How does this affect the effectiveness of fiscal policy? Does a given change in G have larger or smaller effect on Y? Show your answer in a graph (which you should explain). Explain the intuition.

End of exam.

4 Answers

4.1 Answers: Short Questions

1. Causality is not correlation, even if one of the variables is clearly exogenous. The issue is omitted variables. There may be variables that are correlated with climate (perhaps by chance or for [colonial] historical reasons) and that cause variation in income.

2. Any good that is produced using a large up-front investment in R&D will do. The classic example is pharmaceuticals. Average costs are a small marginal cost plus the cost of R&D per unit sold.

3. Romer model:

   (a) See the slides.

   (b) With constant population, inputs to R&D are constant. Diminishing return then imply that the growth of A slows down over time. To offset this, it is necessary to constantly increase R&D inputs. The rate at which this can be done is the population growth rate.
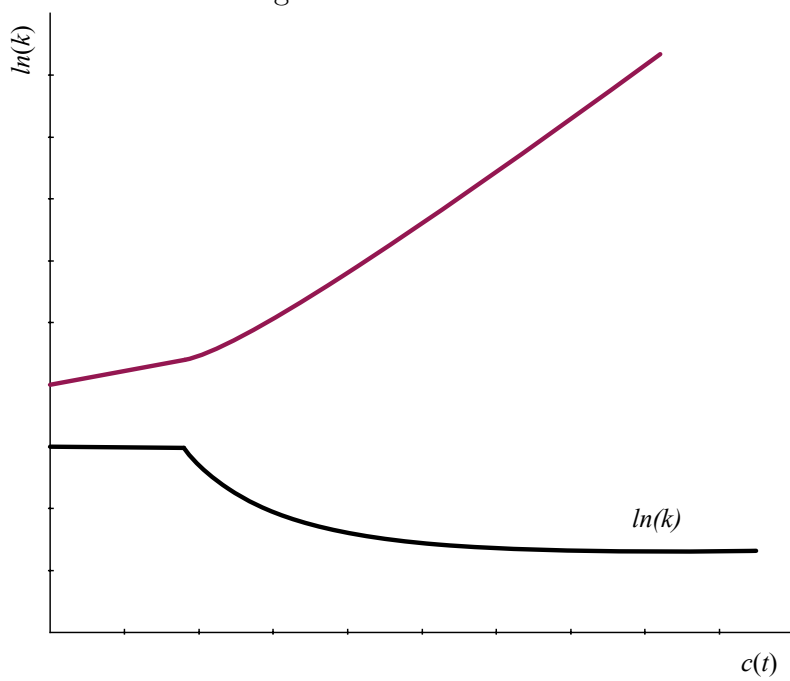
4.2 Answer: Solow Model

1. $\bar{k}^{1-\alpha} = \frac{A^{1-\alpha}s}{n+\delta+g(A)}$.

2. This is the standard Solow diagram:$g\left(\bar{k}\right) = sA^{1-\alpha}\bar{k}^{\alpha-1} - (n + \delta + g(A))$.

3. The $g\left(\bar{k}\right)$ curve shifts down. The steady state value of $\bar{k}$ declines. The transition path is standard with $\bar{k}_0 > \bar{k}_{SS}$ (see the slides).

4. $\ln\left(\bar{k}\right)$: initially constant (balanced growth path). Then declining with the growth rate rising over time (towards 0). $\ln(k)$ is a bit harder to draw. The key is: the slope increases after $t = 0$. See 1.

4.3 Answers: IS/LM

1. LM gets flatter: it takes only a small change in i to "achieve" a given change in Y. Intuition: A given change in i frees up more of the fixed money supply. A larger change in transactions demand Y is needed to make households hold all that cash.

2. Fiscal policy: more effective (just draw the graph where IS shifts right to see this). Intuition: Higher Y requires higher i to clear the money market. When money demand is highly interest elastic, this effect is weaker.

Figure 1: Solow Model

End of answers.