Exam 2. Econ520. Spring 2015

Professor Lutz Hendricks

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. [15 points] Explain how skill-biased technical change can explain the rising college wage premium since the 1980s. Illustrate your answer in a diagram of skilled labor supply and demand. What prevented the skill premium from rising before the 1980s?

2 Romer Model With Depreciation

Recall the key equations of the Romer model:

$$\dot{K}_t = sY_t - \delta K_t \tag{1}$$
$$Y_t = A_t K_t^{\alpha} (s_Y L_t)^{1-\alpha} \tag{2}$$
$$\dot{A}_t = B(s_A L_t)^{\lambda} A_t^{\phi} - \delta_A A \tag{3}$$
$$n = \dot{L}_t / L_t \tag{4}$$

Relative to the model we studied in class, I made a single change: A now depreciates at rate δ_A.

Questions:

1. [10 points] Derive the balanced growth rate of A. If you cannot do this, proceed by assuming that balanced growth rate is the same as in the model without depreciation:

$$g(A)^* = \frac{\lambda n}{1-\phi} \tag{5}$$

2. [10 points] To simplify graphing the model, assume from now on that $\lambda = 1$ and $\phi = 0$. Plot $g(A)$ against A/L. Explain key properties of the graph.

3. [20 points] Suppose the economy starts on the balanced growth path with $\delta_A = 0$. At time 0, δ_A increases permanently. Show the time path of A/L. Explain. Also solve for the level of A/L on the balanced growth path and how that it declines.

3 IS/LM

Recall the equations of the IS/LM model:

$$IS: \ Y = C(Y - T) + I(Y, i) + G \tag{6}$$
$$LM: \ M/P = YL(i) \tag{7}$$

Questions:

1. [25 points] Suppose the government wants to expand output without crowding out investment. Would a monetary expansion look more promising or would a fiscal expansion look more promising?

   Explain and illustrate your answer in an IS/LM diagram. Provide intuition.

2. [20 points] Suppose the Fed follows an interest rate rule, i.e., the Fed adjusts the money supply to hold the interest rate near a constant target. Would that stabilize or amplify shocks to aggregate demand for goods? Illustrate your answer in a diagram.

End of exam.

4 Answers

4.1 Short Questions

1. Key points: the supply of college educated labor has been rising for a long time. By itself, this would push down the college premium. However, the demand for college educated labor has also been rising ("skill biased technical change," whatever that exactly is). Until the 1980s, the two forces roughly balanced each other and the college premium was more or less constant. In the 1980s, college attainment stalled but demand continued to rise. See the graph in the slides.

4.2 Romer Model With Depreciation

1. $g(A) = B(s_A L)^{\lambda} A^{\phi-1} - \delta_A$. Constant $g(A)$ requires constant $L^{\lambda}/A^{1-\phi}$ or $\lambda n = (1-\phi) g(A)^*$. Surprisingly, knowledge depreciation does not change the balanced growth rate of A.

2. See Figure 1. We now have $g(A) = Bs_A L/A - \delta_A$. This is downward sloping in A/L. An increase in δ_A shifts the curve down.

3. We start at point I. The increase in depreciation shifts the $g(A)$ curve down. Initially the economy is at II. Since $g(A) < n$, A/L is falling over time. No surprise: we invest the same amount as before, but there is more depreciation. The growth of A slows for some time until the new, lower balanced growth level of A/L is reached.

   The balanced growth level of A/L solves $g(A) = n = B(s_A L)/A - \delta_A$ or $(A/L)^* = \frac{Bs_A}{n+\delta_A}$.

   The time path of $\log(A)$ is shown in panel (b).

4.3 IS/LM

1. Monetary expansion: LM shifts out. $Y \uparrow$ and $i \downarrow$. $I \uparrow$ unambiguously.

   Intuition: This is how a monetary expansion works. It pushes liquidity into the economy, which lowers interest rates. The induces increase in I is the reason why Y rises.

   Fiscal expansion: IS shifts out. $Y \uparrow$ and $i \uparrow$. The change in I is ambiguous.

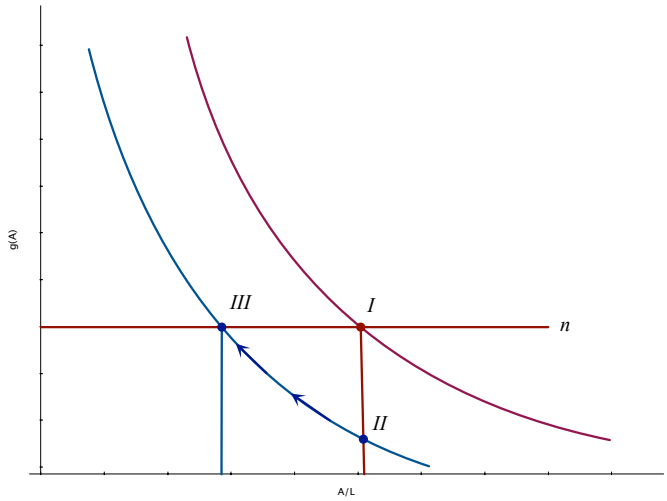
   Intuition: $G \uparrow$ directly increases Y. The increase in money demand pushes interest rates up. This is bad for investment.

2. Interest rate rule:

   Shocks to aggregate demand shift IS. If the Fed does "nothing" (holds M constant), the interest rate rises in response to a positive demand shock, which stabilizes the economy. If the Fed holds i constant, this stabilizer disappears and shocks get amplified (because $M \uparrow$ when demand $\uparrow$). Graph: see Figure 2

Figure 1: Romer Model With Depreciation

(a) Romer diagram



(b) Time path of A

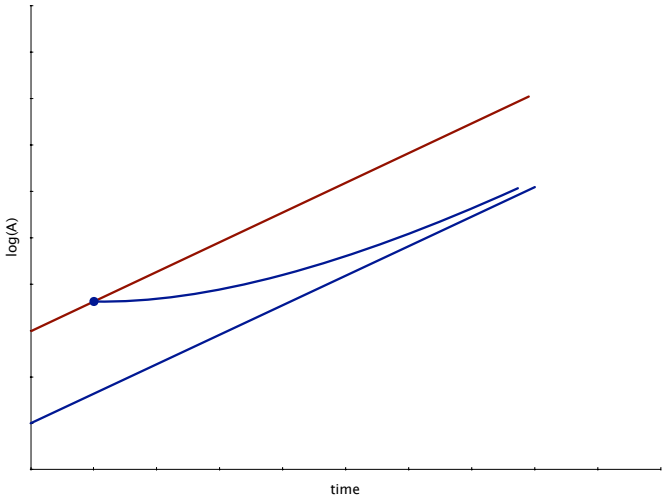
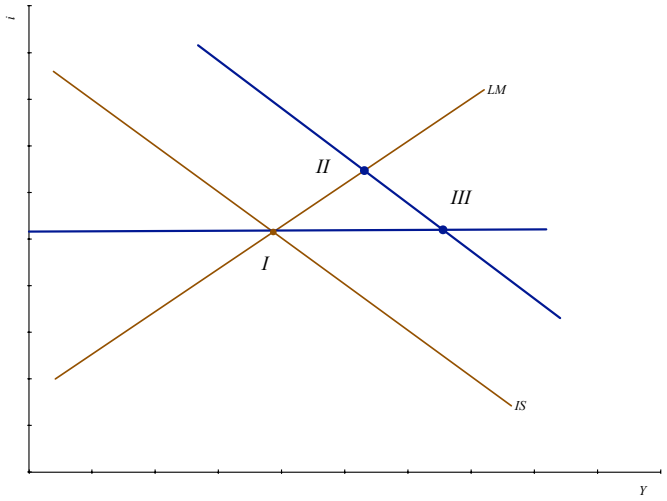


Figure 2: Interest Rate Rule



End of answers.