

Georgia Institute of Technology
Advanced Macroeconomics
Spring 2008
QUIZ # 8 Key

Five short-answer question, please work out the problems, Go systematically and write down your steps clearly.

1. Consider the Harrod-Domar's growth model. The saving rate is 10%, and the ratio of capital to real output is 0.8. If the initial real output of this economy at the beginning of the year is 10000 units, the real output of this economy at the end of the year equals

- a. 15000.
- b. 12000.
- ♠ **11250.**
- d. 12250.
- e. none of the above.

$$\begin{aligned}\frac{\Delta Y}{Y} &= \frac{\sigma}{\gamma} \\ \text{given } \sigma &= 0.1, \quad \gamma = 0.8, \quad Y_0 = 10000 \\ \frac{\Delta Y}{Y} &= \frac{0.1}{0.8} = 0.125 \\ \frac{Y_1 - Y_0}{Y_0} &= 0.125 \\ Y_1 &= 1.125Y_0 = 1.125 \times 10000 = 11250\end{aligned}$$

2. In an economy capital depreciation rate δ and labor force grows at rate of n . In this economy by mistake if steady-state capital-labor ratio is passed, meaning we are to the right of steady-state κ^* , in such a situation which of the following statement is true?

- a. The real output per labor will be higher than at steady-state output.
- b. The capital per labor κ will decrease.
- c. The percentage change in y is positive.
- d. The real output per labor will be less than steady-state output y^* .

♠ **none of the above is true**

This problem was hard. In the class I told you

$$\frac{y}{\kappa} = \frac{\frac{Y}{L}}{\frac{K}{L}} = \frac{Y}{K}.$$

Therefore at **Steady-state** Solow model speaks about output-capital ratio not about output-labor ratio. Please take note of it. The steady-state condition

$$\frac{\Delta \kappa^*}{\kappa^*} = s \left(\frac{y^*}{\kappa^*} \right) - s\delta - n = 0$$

Given s , δ , and n , if you pass κ^* , then

$$\frac{y}{\kappa} = \frac{Y}{K} < \frac{Y^*}{K^*}$$

which makes $\frac{\Delta \kappa}{\kappa} < 0$. Therefore, if you pass the steady-state solution, your output-capital ratio becomes less than its steady state value, capital becomes less productive.

3. According to Solow growth model, the best measure of a country's growth is the growth of

- a. real domestic investment.
- b. real GDP.
- ♠ **real GDP per labor.**
- d. real consumption expenditures.
- e. real saving rate.

4. Solow's theory of economic growth concludes, "the possibility of steady-state growth would be a miraculous stroke of luck" because

♠ **the three "determinants," s , (Y/K) , and n are caused by different unrelated behavior.**

- b. s reflects temporal consumption preferences.
- c. δ reflects unrelated depreciation.
- d. n reflects birth control decision.

5. Assume of Cobb-Douglas production function

$$Y = K^\alpha L^{1-\alpha}.$$

For this production function the real output-labor ratio y equals

- a. $\left(\frac{K}{L}\right)^\alpha = MPL$
- b. $\left(\frac{L}{K}\right)^{1-\alpha} = MPK$
- c. $\left(\frac{K}{L}\right)^{1-\alpha} = MPL$
- d. $\frac{K}{L} = MPA$

♠ **none of the above.**

$$MPL = \frac{dY}{dL} = (1 - \alpha)K^\alpha L^{-\alpha} = (1 - \alpha)\frac{Y}{L} = (1 - \alpha)y$$

this proves that (a) and (c) are not correct

$$MPK = \frac{dY}{dK} = \alpha K^{\alpha-1} L^{1-\alpha} = \alpha \frac{Y}{K}$$

this proves that (b) is not the answer

there is no A in the output function, (d) is not the answer

$$\text{therefore } \frac{MPL}{1 - \alpha} = y$$