Week 8 Tutorial Solution
ECON203: Macroeconomics 2
Dr. Lei Pan
Australian Catholic University
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Multiple Choice Questions

Question 1. The per-worker production function in the Solow model assumes
(a) constant returns to scale and increasing marginal productivity of capital.
(b) constant returns to scale and diminishing marginal productivity of capital.
(c) increasing returns to scale and diminishing marginal productivity of capital.
(d) decreasing returns to scale and diminishing marginal productivity of capital.

Answer: B

Question 2. The bowed shape of the per-worker production function is caused by
(a) wealth effects that reduce labour supply.
(b) diminishing marginal productivity of capital.
(c) increasing marginal productivity of labour.
(d) increasing marginal productivity of capital.

Answer: B

Question 3. In the Solow model, if productivity doesn't change,
(a) the economy must eventually reach a steady state.
(b) the capital-labour ratio must decline.
(c) the capital-labour ratio must rise.
(d) there can be no saving.

Answer: A

Question 4. In a steady state
(a) both consumption per worker and the capital-labour ratio are constant.
(b) consumption per worker is constant, but the capital-labour ratio can change.
(c) capital and labour, by definition, are inversely related to one another.
(d) consumption per worker can change, but the capital-labour ratio is constant.

Answer: A

Question 5. Steady-state investment per worker is positively related to the capital-labour ratio because the higher the capital-labour ratio
(a) the lower the capital depreciation rate.
(b) the greater the amount of resources available for capital investment.
(c) the more investment per worker is required to replace depreciating capital.
(d) the less the economy needs to equip new workers with the same high level of capital.

Answer: C

Question 6. In the absence of productivity growth, in a steady-state economy
(a) output per worker and consumption per worker remain constant over time.
(b) output per worker remains constant over time, but consumption per worker grows over time.
(c) output per worker grows over time, but consumption per worker remains constant over time.
(d) output per worker and consumption per worker both grow over time.

Answer: A

Question 7. The level of the capital-labour ratio that maximizes consumption per worker in the steady state is known as the
(a) Solow residual capital-labour ratio.
(b) Golden Rule capital-labour ratio.
(c) q theory capital-labor ratio.
(d) dynamically efficient capital-labour ratio.

Answer: B

Question 8. If the capital-labour ratio is above the Golden Rule capital-labour ratio, then in the steady state,
(a) capital per worker is above its maximum.
(b) output per worker is less than it would be at the Golden Rule capital-labour ratio.
(c) investment per worker exceeds output per worker.
(d) consumption per worker is not at its maximum.

Answer: D

Question 9. The idea that saving equals investment in the Solow model means that a steady state can be reached only when
(a) $s = k$.
(b) $s = n + d$.
(c) $sf(k) = (s + d)k$.
(d) $sf(k) = (n + d)k$.

Answer: D

Question 10. If $f(k) = 2k^{0.5}$, $s = 0.3$, $n = 0.05$, and $d = 0.15$, what is the value of k at equilibrium?
(a) 1
(b) 3
(c) 6
(d) 9

Answer: D

Problem Solving Questions

Question 11. Two countries are identical in every way except that one has a much higher capital-labour ratio than the other. According to the Solow model, which country's total output

will grow more quickly? Does your answer depend on whether one country or the other is in a steady state? In general terms, how will your answer be affected if the two countries are allowed to trade with each other?

The initial level of the capital-labour ratio is irrelevant for the steady state. Two economies that are identical except for their initial capital-labour ratios will have exactly the same steady state.

Since the two economies must have the same growth rate at the steady state, and since the economy with the higher current capital-labour ratio has higher current output per worker, then the country with the lower current capital-labour ratio must grow faster.

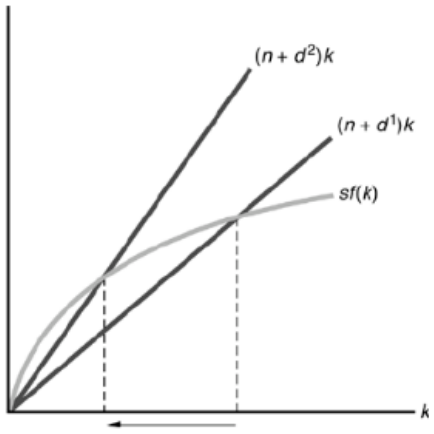
The answer holds true regardless of which country is in a steady state. If the country with a higher initial capital-labour ratio is in a steady state at capital-labour ratio k^*, then the other country's capital-labour ratio will rise until it too equals k^*. So the country with the lower capital-labour ratio grows faster than the one with the higher capital-labour ratio.

If the country with the lower initial capital-labour ratio is in a steady state at capital-labour ratio k^*, then the other country's capital-labour ratio is too high and it will decline until it equals k^*. So the country with the higher capital-labour ratio must grow more slowly than the country with the lower capital-labour ratio. If the two countries are allowed to trade with each other, then their convergence to the same capital-labour ratio and output per worker will occur even faster.

Question 12. An economy is in a steady state with no productivity change. Because of an increase in acid rain, the rate of capital depreciation rises permanently.

(a) According to the Solow model, what are the effects on steady-state capita per worker, output per worker, consumption per worker, and the long-run growth rate of the total capital stock?

The rise in capital depreciation shifts up the $(n + d)k$ line from $(n + d^1)k$ to $(n + d^2)k$, as shown in the following figure. The equilibrium steady-state capital-labour ratio declines. With a lower capital-labour ratio, output per worker is lower, so consumption per worker is lower (using the assumption that the capital-labour ratio is not so high that an increase in k will reduce consumption per worker). There is no effect on the long-run growth rate of the total capital stock, because in the long run the capital stock must grow at the same rate (n) as the labour force grows, so that the capital-labour ratio is constant.



(b) In an endogenous growth model, what are the effects on the growth rates of output, capital, and consumption of an increase in the depreciation rate of capital?

In an endogenous growth model, the growth rate of output is $\Delta Y/Y = sA - d$, so the rise in the depreciation rate reduces the economy's growth rate. Similarly, the growth rate of capital equals $\Delta K/K = sA - d$, which also declines when the depreciation rate rises. Since consumption is a constant fraction of output, its growth rate declines as well. So the increase in the depreciation rate reduces the long-run growth rate of the capital stock, as well as long-run capital, output, and consumption per worker.