QUESTIONS FOR REVIEW

1. Why is capital a natural suspect when we consider differences in income per capita among countries?
2. What is the evidence in favor of the theory that differences in income among countries are due to differences in investment rates? What is the evidence against this theory?
3. What is the effect of an increase in the investment rate on the level of steady-state output per worker in the Solow model? What is the effect of an increase in the investment rate on the growth rate of output per worker in the model?
4. How does the issue of whether saving rates are endogenous or exogenous affect our interpretation of how well the Solow model explains income differences among countries?
5. Why can't a country grow forever solely by accumulating more capital?

PROBLEMS

1. Explain whether or not each of the following is physical capital:
   a. A delivery truck
   b. Milk
   c. Farmland
   d. The Pythagorean Theorem
2. A country is described by the Solow model, with a production function of $y = k^{1/2}$. Suppose that k is equal to 400. The fraction of output invested is 50%. The depreciation rate is 5%. Is the country at its steady-state level of output per worker, above the steady state, or below the steady state? Show how you reached your conclusion.
3. Describe in words and with a diagram an example of a steady state from outside of economics, similar to the one discussed in the box on page 61.
4. In Country 1 the rate of investment is 5%, and in Country 2 it is 20%. The two countries have the same levels of productivity, A, and the same rate of depreciation, δ. Assuming that the value of α is 1/3, what is the ratio of steady-state output per worker in Country 1 to steady-state output per worker in Country 2? What would the ratio be if the value of α were 2/3?
5. The following tables show data on investment rates and output per worker for three pairs of countries. For each country pair, calculate the ratio of GDP per worker in steady state that is predicted by the Solow model, assuming that all countries have the same values of A and δ and that the value of α is 1/3. Then calculate the actual ratio of GDP per worker for each pair of countries. For

which pairs of countries does the Solow model do a good job of predicting relative income? For which pairs does the Solow model do a poor job?

a.

Country	Investment Rate (Average 1970–2005)	Output per Worker in 2005
Thailand	30.3%	$14,260
Bolivia	9.9%	$6,912

b.

Country	Investment Rate (Average 1970–2005)	Output per Worker in 2005
Nigeria	7.5%	$3,648
Turkey	14.6%	$17,491

c.

Country	Investment Rate (Average 1970–2005)	Output per Worker in 2005
Japan	31.3%	$48,389
New Zealand	20.7%	$43,360

6. Country X and Country Y have the same level of output per worker. They also have the same values for the rate of depreciation, δ, and the measure of productivity, A. In Country X output per worker is growing, while in Country Y it is falling. What can you say about the two countries' rates of investment?

7. In a country the production function is $y = k^{1/2}$. The fraction of output invested, γ, is 0.25. The depreciation rate, δ, is 0.05.

   a. What are the steady-state levels of capital per worker, k, and output per worker, y?

   b. In year 1, the level of capital per worker is 16. In a table like the following one, show how capital and output change over time (the beginning is filled in as a demonstration). Continue this table up to year 8.

Year	Capital k	Output $y = k^{1/2}$	Investment γy	Depreciation δk	Change in Capital Stock $\gamma y - \delta k$
1	16	4	1	0.8	0.2
2	16.2				

   c. Calculate the growth rate of output between years 1 and 2.

   d. Calculate the growth rate of output between years 7 and 8.

   e. Comparing your answers from parts c and d, what can you conclude abou the speed of output growth as a country approaches its steady state?

8. Suppose that there are no investment flows among countries, so that the fraction of output invested in a country is the same as the fraction of output saved. Saving in an economy is determined as follows: There is a subsistence level of consumption per worker, c^*. If income per worker is equal to c^*, people will consume all of their income. All income per worker in excess of c^* will be split between consumption and investment, with a fraction γ going to investment and the rest going to consumption. Use a diagram like Figure 3.4 to analyze the steady states of this economy.

dy/dx 9. Consider an economy in which the amount of investment is equal to the amount of saving (that is, the economy is closed to international flows of capital). Any output that is not saved is consumed. The production function is $y = Ak^{\alpha}$. Find the value of γ, the fraction of income that is invested, that will maximize the steady-state level of consumption per worker. (This is called the "golden rule" level of investment.)

For additional exploration and practice using the Online Data Plotter and data sets, please visit www.aw-bc.com/weil.