

Practice Problem Set #6

EC202C1, Spring 2012, Jeremy Smith

1. Consider the full Solow growth model with exogenous technological progress and employment growth. The economy is described by the production function $Y = \sqrt{K}\sqrt{AN}$. Technology, A , grows at the fixed percentage rate g_A per period, and employment, N , grows at the fixed percentage rate g_N per period. The capital stock, K , depreciates at the fixed rate δ per period, and the economy saves a fixed proportion, s , of output, Y , per period. Assume throughout that taxes and government expenditure are zero.

- a) Convert the production function to intensive form (i.e. find an expression for output per effective worker).
- b) Write down the condition that must hold for the change in capital per effective worker between years t and $t+1$ to be zero and hence for the economy to be in a steady state. (You do not need to derive this from the capital accumulation equation as we did in class. Instead, reason your way towards it, as is done at the bottom of page 241 in the custom-printed version of the textbook. You should understand this reasoning, and write it down in your own words.)
- c) Find expressions for the steady state levels of capital per effective worker and output per effective worker. Show your work.
- d) Find the steady state growth rates of output per effective worker, output per worker and output. Also find the steady state growth rate of consumption per worker. Show and explain your work.
- e) Find the values of the steady state level of capital per effective worker and the steady state growth rate of output per worker if the saving rate is 16%, the depreciation rate is 10%, employment growth is 2% and technology growth is 4%.
- f) Find the values of the steady state level of capital per effective worker and the steady state growth rate of output per worker if the saving rate is 14%, the depreciation rate is 5%, employment growth is 3% and technology growth is 6%.
- g) Comparing parts e) and f), does it appear that, other things equal, the level of capital per effective worker has any relevance for the average standard of living in the long run?
- h) Suppose that the economy is in the steady state corresponding to the parameter values in part e). Then, the saving rate suddenly and permanently jumps to 32%. Find the new steady state level of capital per effective worker corresponding to the higher saving rate. Draw and carefully label a graph illustrating this situation, showing the levels of capital per effective worker and output per effective worker in the old steady state and in the new steady state. Describe briefly and without doing any calculations how the economy will converge to the new steady state. What happens to the growth rate of output per worker as the economy moves from the old steady state to the new steady state?