

**EC202C1 – Intermediate Macroeconomic Analysis  
Spring 2012, Boston University**

Instructor: Jeremy Smith

**Second Mid-term Exam (Practice #1)**

Thursday, April 5, 2012

This is a 50-minute exam. There is a total of 50 points allocated across two questions. Use the number of points allocated to each part as a suggestion for how long to spend on that part. I recommend that you attempt all parts before using more time than is suggested for any one part. If you complete some parts in less than the suggested time, use your extra time to revisit parts you may have had trouble with the first time through and to check your work.

Please read the questions carefully and write your answers in the space provided. You can use the backs of the sheets for scrap paper, but to get full credit you must show all relevant work in the space provided.

Please follow my instructions at all times.

Concentrate and think carefully, but try to relax too!

**Student Number:**

(Please do not include your name.)

1. [35 points total, 4 parts] Consider the simple Solow model with no technological progress and no employment growth. The economy is described by the production function  $Y = A\sqrt{K}\sqrt{N}$ . Technology,  $A$ , and the number of workers,  $N$ , are constant. The capital stock,  $K$ , depreciates at the fixed rate  $\delta$  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) [11 points] Derive the expression for the steady state capital-labor ratio. Show all of your work.

b) [8 points] Suppose that the saving rate increases to  $s' > s$  but that technology, the depreciation rate and employment stay constant. Show the initial steady state capital-labor ratio and the new steady state capital-labor ratio in a carefully-labeled graph. You do not need to include the production function.

c) [8 points] Assume that the depreciation rate is 5%, the saving rate is 35%, and the level of technology is 25. Calculate the steady state levels of output per worker, investment per worker, depreciation per worker, and consumption per worker.

d) [8 points] Continue to assume that the depreciation rate is 5%, the saving rate is 35%, and the level of technology is 25. The economy has been in its corresponding steady state for several periods. Then, in some period  $t$ , the level of technology suddenly jumps to 30, and stays at this new level permanently. Calculate the level of output per worker in periods  $t-1$ ,  $t$ , and  $t+1$ .

2. [15 points total, 2 parts] 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 6% per period, and employment,  $N$ , grows at 3% per period. The capital stock,  $K$ , depreciates at 5% per period, and the economy saves 14% of output,  $Y$ , per period. Assume throughout that taxes and government expenditure are zero.

a) [8 points] Calculate the steady state level of capital per effective worker.

b) [7 points] State the rate at which each of the following variables is growing when the economy is in the steady state.

Output \_\_\_\_\_

Output per worker \_\_\_\_\_

Output per effective worker \_\_\_\_\_

Consumption per worker \_\_\_\_\_

Investment per effective worker \_\_\_\_\_

The saving rate \_\_\_\_\_

Depreciation \_\_\_\_\_