

## Growth Miracle Exercise Spring 2006

This exercise based on the Solow Growth model and deals with the Japanese Growth miracle from 1950 to 1990. You will need to use an excel spread sheet and the PWT tables, the link of which is provided on the course homepage.

**Preferences:** People eat fraction  $(1-s_t)$  of their income. (Note that the savings rate is indexed by time to allow for it to change over time, as it does in the data.)

**Production Technology:**  $Y_t = K_t^\theta [(1.02)^t N_t]^{1-\theta}$

Capital accumulates according to the following equation:  $K_{t+1} = 0.95 K_t + X_t$ .

**Population Dynamics** The population dynamics are exactly those for Japan in the PWT.

### Questions:

1. **Get the Data.** The first step is to obtain the data we will need to use in the experiment. Go to the PWT and obtain the following variables for Japan in each year from 1950 to 1990: population, CGDP relative to the US; and the Investment Share of CGDP (the savings rate). Plot each series against time. (One graph per series is required).
2. **Determine Japan's TFP.** The next step is to determine the TFP for Japan,  $A^J$ . To do this you first need to determine the relative balanced growth path per capita GDPs of Japan relative to the United States. For this, .80 seems like a reasonable value looking at the plot from question 1. Once we have this number, we can solve for the TFP of Japan plugging in the Japanese population growth rate (take the average over the 1980-1990 period), the Japanese savings rate (take the average over the 1980-90 period) using the formula's for the balanced growth path for per capita GDP (relative to the balanced growth path of per capita GDP for the US economy). Thus, to complete this you will need the US savings rate of .20, the US population growth rate of 1%, and the US TFP  $A^{US}=1.0$ . Do this for  $\theta=1/3$ .
3. **Determine  $K_{1950}$ :** Find Japan's capital stock in 1950 by setting it equal to the value for which Japan's per capita GDP relative to the United States in 1950 is exactly the number reported in the Penn World Tables. Note, for the United States, it is on its balanced growth path in 1950. Hence,  $k_{1950}$  for the United States is the balanced growth path at the first period  $k_0^{BGP}$ .
4. **Determine Japan's Miracle:** The next step is to determine the path of Japan's per capita GDP from 1950 to 1990 given the  $A^J$  determined in step 2, Japan's 1950 populations given in the PWT, and  $k_{1950}$  determined in step 3. Use the actual savings rates and populations you plotted in step 1. Create a figure that plots Japan's per capita GDP relative to the United States from the PWT with the data generated by the model. (For the US, it is on its steady state with  $A=1$ ).
5. Repeat Questions 2-5 with  $\theta=.50$  and then with  $\theta=2/3$ .

### Summary and Synthesis

6. In no more than 150 words, describe the 5 steps of the calibration procedure as they pertain to this experiment.
7. In no more than 150 words, explain what we learn from this experiment.