

Problem Set 2 Solutions

14.75J

10/28/03

Part A

1. Just list the countries chosen.
2. There are several things you were expected to do here
 - a. Tell me what variables you used, and if you made any calculations, what they were.
 - b. Give all money values in real, not nominal values. Most, if not all, of the countries had data available in that format. That means you will report things in constant US dollars, not current US dollars.
 - c. The question asked for data on savings and investment, not savings and investment rates.
 - d. As I discussed in my last handout, growth rate is expressed as a percentage, so a constant growth rate will create an exponential graph, not a linear one.
 - e. Also, in the same vein, the same slope does not mean the same growth rate. If 2 lines are parallel, the variable represented by the lower line has a larger growth rate, because the growth rate is calculated as $\frac{x_{t+1} - x_t}{x_t}$.
 - f. If, for instance, you draw graphs of GDP and the lines for the developing countries are so low that you really can't tell how fast they are growing, do something to find out. For instance, graph the small ones on different axes so you can see what is happening. Or graph the growth rates for those countries and say "I have used the data from the above graph to calculate the growth rate of GDP for Thailand. For each year, I found the increase in GDP from year t to year t+1 and then divided by GDP in year t. Results are shown in the graph below." Do not refer me to your excel spreadsheet, it doesn't tell me what calculations you made it only gives the numbers you got, so I can't tell from looking at that what calculations you made.
 - g. Keeping the above in mind, make sure to graph all 3 on one graph as well, in order to compare levels.
 - h. Make your graphs easily readable—have a legend that labels each line and labels on the axes that tell the units.
 - i. I will just make a plea here to save paper and make your problem sets easier for me to read—each excel graph does not in any way need to take up a complete page, you can put several on the same page, and if you can insert the excel graphs into the text so I don't have to page back and forth, that's wonderful. Also, if you can print double-sided, that is great.
3. Calculate the average population growth for each country, and state what data you are using (did you start from population values or download data on population growth?) and what calculations, if any, you had to make. Once again, do not refer

- me to your excel spreadsheet, although telling me what data and equations you used in your excel spreadsheet would be good.
4. Once again, clearly state what data you are using and what calculations you made. Also state clearly what assumptions you are making and why, ie “I assumed that the depreciation rate was .05 because I couldn’t find data on net national product or net investment.” Ideally, you should then discuss why this assumption might be problematic, for instance why you think this might be a more accurate assumption for some countries or some time periods than others.
 5. Once again, calculate the average and state what data you are using and what calculations, if any, you had to make, and do not refer me to your excel spreadsheet.

Part B

1. There are also several things to keep in mind here.
 - a. As I stated in my last handout, the Solow model assumes that the rates of savings, population growth, depreciation, and technology growth, are all constant, and the model only makes sense in that context. Therefore, when drawing the graph you should use the averages that you calculated. So the investment curve should be some constant (the average savings rate) times the output curve, and the $(n+d)*k$ line should be precisely linear, because it is a constant times the value on the x-axis.
 - b. Once again, please explain what data was used and what calculations were made and do not refer me to your excel spreadsheet.
 - c. Make nice, readable graphs.
 - d. Be very careful with units. For many of you who ended up with illogical graphs, both here and in part C, I believe units were the problem.
2. This is one of the parts where many of you lost many points. It is possible to get a lot of credit on this one even if your graphs are not good as long as you realize that your graphs are not good. You really need to think here about what the model means, what it predicts, and whether your graph makes sense. If your graphs look nothing like you expect them to look, you might want to go back and try to fix them. If you manage to trace out a nice production function, what does that mean about whether the country was in steady state? If the savings and depreciation lines don’t cross, what does that mean about where the predicted steady state is? Feel free to come to my office hours to discuss this question.
3. See the discussion of conditional convergence in the textbook.

Part C

1. I did not grade this one, because most of you did not make any calculations, and so I did not want to take off points from people who actually made the effort, but incorrectly. There is wage data in the other web site I emailed you to look at, <http://libraries.mit.edu/get/uncommon>. You should be able to use this data to make the

- calculations discussed. As always, state what data you are using and what calculations you are making and be careful about units.
- 2, 3, and 4. Basically, just remember all the same things I've discussed in the previous answers. Just a couple more things:
- a. As I discussed in my last handout, the level of technology should never be negative—you need to assume that A_0 is some positive constant, and even if the growth rate is always negative the LEVEL of technology will remain positive, it will simply get closer and closer to zero.
 - b. Remember, the $(n+d)k$ line changes when you are graphing the Solow model **with** technological change