Problems

Watch for updates, this version from 24 January 2017

Problem set 1: Do problems M1, M2, and M3 below.

Problem set 2: Do problems S1, S2, and L1 below.

Problem S1. Download the state antiquity data set (v3.1) from Putterman's website:

http://www.econ.brown.edu/fac/louis_putterman/antiquity%20index.htm

(a) Delete the first row and save as a csv file on your machine.

Write a do file in Stata to do the following:

(b) Open state antiquity data using the command `insheet`.

(c) Drop all variables except statehistn05v3. Name the variable StateHist using `rename`.

(d) Create a histogram showing the distribution of StateHist.

(e) Save the data in Stata format in some folder on your machine.

Problem S2.

Part A:

(a) Go to

http://www.systemicpeace.org/inscrdata.html

and download the file "Polity IV Annual Time-Series, 1800-2014" in excel format. Save as a csv file on your machine.

Write a Stata do file to do the following:

(b) Open the Polity IV data using the command `insheet`.

(c) Each observation refers to a country and a year. The year indicates when democracy is measured (the variable polity2). (Disregard byear for the moment.) Create a variable called start_year, such that for each observation it indicates the first year in the 50-year period that the year of that observation falls into, where each 50-year period refers to 1800-1849, 1850-1899, etc. That is, each observation referring to year 1832, say, should have start_year=1800.

(d) Use `kountry` to convert the variable scode (which is on "Correlates of War" format) into a World Bank code. Name the resulting code wbcode.

(e) Use `concat` to create a string variable named id that consists of start_year and wbcode.

(f) Use the command `collapse` to create a new data set that contains the means of polity2 (the democracy variable) over each id outcome (hint: use `by`). Also keep the variables wbcode, ccode, country, and start_year. (Hint again: use `first` or `min` for those variables, like you used `mean` for polity2.) The resulting data set should contain a variable measuring the mean of polity2 for each country over different 50-year periods, starting 1800, 1850, etc.

Part B:

(a) Download Putterman's state antiquity data set again, as in S1. First do some cleaning in excel. Delete the very first row. Then delete those columns with state presence variables (taking values from 0 and 50) which refer to periods starting earlier than 1750. Name the remaining ones SP_1900, SP_1850, SP_1800, and SP_1750 in the first row of the excel file. (SP as is state presence, numbers indicating start year of the half-century.). Keep the columns named wbcode and wbname, but make sure these names appear on the same row as the SP names. That is, you should have an Excel sheet with six columns and several rows (one for each country), where the first row contains the name of the variable: wbcode, wbname, SP_1900, SP_1850, SP_1800, and SP_1750. Save as a csv file on your machine.

(b) Open the State History data using the command `insheet`. Note that all the sp variables now are in lower-case letters.

(c) This data has several state presence variables, each referring to a different half century. Reorganize the data such that one single variable, called state_presence, contains the "stacked" data of all the variables starting with sp, and the two remaining variables (wbcode and wbname) are stacked next to state_presence. This can be done with the command `stack`.

(d) The `stack` command used under (c) should also genarete a new variable that by default is called _stack, taking values 1, 2, etc. Use _stack to create a new variable, called year, that indicates the start year of the 50-year period over which state presence is measured.

(e) Use `concat` to create a string variable named id that consists of the variables year and wbcode.

Part C

(a) Use `merge` to create a data set containing the variables from both Parts A and B. Drop observations that are not matched (missing in either data set).

(b) Use `tsset` to declare the data set a panel data set, choosing which variables to use as time and panel variables.

(c) Regress democracy (the averaged polity2 for the respective period) on the state presence variable, with both period (year) and country fixed effects. Easiest might be to use `areg` with `absorb`.

Problem M1. Consider the two-sector model discussed in class.

(a) Do the exercise on the last page of the slides. That is, find expressions for K_0, N_0, $A_{M,0}$, and $A_{S,0}$ in terms of μ, ϕ, β, R, w^*, n^*, L, and T.

(b) Run the of the Matlab code posted on the course website. Use your answer under (a) to rewrite the segment where initial conditions are determined.

(c) Add a code that produces a figure with four panels (A-D) showing the time paths of some variables as follows:

- Panel A should show the paths of the interest and wage rates.
- Panel B should show the paths of the capital stock and population for the whole economy (i.e., in both sectors).
- Panel C should show the paths of the capital stock and population in the Malthus sector.
- Panel D should show the paths of the factor shares in the Solow sector ($z_{N,t}$ and $z_{K,t}$).

Problem M2. Consider this overlapping-generations model. Time is discrete and agents live for T periods. Let $P_{j,t}$ be the size of the population of age $j \in \{1, 2, ..., T\}$ in period $t \in \{0, 1, ...\}$, referred to as cohort j, t. Let $n_{j,t}$ be the birth rate of cohort j, t. Let $\underline{B}$ and $\overline{B}$ (where $\underline{B} < \overline{B}$) be the threshold ages for child rearing, such that $n_{j,t} = 0$ for all ages $j < \underline{B}$ and $j > \overline{B}$. Furthermore, let $n_{j,t} = \gamma y_t$, for all ages $j \in \{\underline{B}, ..., \overline{B}\}$, where y_t is per-capita income, assumed to be the same across all cohorts of age $j > \underline{B}$. That is, with Y_t being total output in period t,

$$y_t = \frac{Y_t}{\sum_{j=\underline{B}}^{T} P_{j,t}}.$$

Output is produced using time-dependent land (L_t), and labor; all agents work from age $\underline{B}$. The production function is Cobb-Douglas:

$$Y_t = L_t^{\alpha} \left[\prod_{j=\underline{B}}^{T} P_{j,t}^{\beta_j} \right]^{1-\alpha},$$

where $\sum_{j=\underline{B}}^{T} \beta_j = 1$, and $\alpha \in (0, 1)$. That is, β_j captures the importance in the production process of labor supplied by age group j.

(a) Write $P_{1,t}$, in terms of all the $n_{j,t-1}$ and $P_{j,t-1}$, across age groups $j \in \{\underline{B}, ..., \overline{B}\}$.

(b) Write a very simple equation for $P_{j,t}$, when $j > 1$ (and $j < T$). (Hint: if you know the number of 7-year olds in 2010, how do you find the number of 8-year olds in 2011?)

(c) Describe briefly in words how you would go about simulating this model. What would you need to make further assumptions about? What parameters would you need to know numerically? What would the algorithm look like?

Problem M3.

(a) Referring to Problem M2 above, write a Matlab code that implements the following:

- Agents live for $T = 30$ periods, work from age $\underline{B} = 8$ to $T = 30$, and rear children from $\underline{B} = 8$ to $\overline{B} = 20$ as described above. (Each period could thus be about 2 years, but that will not matter for solving the problem.)

- The maximum β_j is reached at $j = 18$; β_j falls by 50% per period both forward and backward in age from $j = 18$; and $\sum_{j=\underline{B}}^{T} \beta_j = 1$.

- $\alpha = .5$; $\gamma = .75$.

- $L_t = 100$ until $t = 250$; then drops by 10% and stays constant from then on.

(b) Write a loop that computes for each t total population, total output, and output per worker. Create indices for each one, all equal to 1 in the last period. Show the time paths of the logs of these indices for $t \in [200, 500]$ in the same plot. For now, initial values can be anything; the economy should be roughly in steady state around $t = 200$.

Problem L1. The following lines should recreate a PSTricks graph of the function $y = 8\sqrt{x} - 2x$, similar to one that is posted on the course website:

```
\documentclass{article}
\usepackage{pstricks}
\usepackage{nopageno}
\usepackage{lscape}
\usepackage{pstricks-add}
\begin{document}
\begin{center}
\begin{pspicture}(0,0)(15,15)
\psaxes[linewidth=1pt]{->}(0,0)(15,10)[$x$,-90][$y$,-180]
\psplot[algebraic,linestyle=solid]{0}{15}{8*(x)^.5-2*(x)}
\end{pspicture}
\end{center}
\end{document}
```

Make changes to this code as follows.

(a) Remove the axes ticks and numbers.

(b) Enlarge the x and y on the axes by placing the command `\Large` somewhere.

(c) The function looks kinked close to the origin. Fix this by placing a suitable command containing `plotpoints` (and some more) somewhere.

(d) Make the curve of the function $y = 8\sqrt{x} - 2x$ red, and 2 points thick instead of 1.

(e) Calculate by hand where the function is maximized and use an `\rput` command to add an x^* at that coordinate on the horizontal axis. Also add a dotted vertical line going from x^* to the peak of the curve.

(f) Shrink the whole plot by about 25% using `\psset`.

The end result should look like one of the plots posted online.