Quantitative Economics with Python

David Evans and Thomas Sargent

June 11, 2013

1 Course description

This course aims to teach quantitative economics and the computer language python. We use Python to teach economics and economics to teach Python. The course uses Python to teach fundamentals of computational economics. For our purposes, Python has many advantages.

1. It is free.
2. It is easily scalable for large economic problems and easily portable across different operating systems.
3. It is well documented and has many scientific and numerical packages that are very useful for economic and financial calculations.
4. Its object oriented structure conforms naturally with the way in which we like to teach economics, namely, in terms of classes of objects with common mathematical structures, having affiliated attributes or 'methods' to which we want access.
5. It is fun.
6. It is widely used in science, finance, and industry. A working knowledge of it gives students a big advantage in terms of landing summer jobs, internships, and research assistant jobs.

The course will use an online text being written by John Stachurski and Thomas Sargent, as well as additional materials that we will supply in class.

Every economic topic will have a python counterpart. This will discipline our economics and our programming.

Among the economic topics that we shall cover are:

1. Linear programming and comparative advantage.
2. Networks.
3. Present value and its relationship to z transforms and Fourier transforms (don't be afraid, we shall explain everything from the ground up).
4. Milton Friedman's model of permanent income.
5. Robert Barro's model of tax smoothing (virtually the same as Milton Friedman's model).
6. The celebrated McCall search model for prices and wages.
7. The classical growth model.
8. Fiscal policy in the growth model.
9. Introduction to linear time series models.
10. Applications of the Kalman filter to problems in economics and econometrics. Classic models as instances of the Kalman filter.
11. Data analysis and manipulation using pandas.
12. Analysis of implications of the government's present value budget constraint, including 'unpleasant monetarist arithmetic' and 'Ricardian equivalence'.

From the programming perspective, we expect students to leave the course with the ability to:

1. Write code for economics problems that is flexible and able to adapt to changes in fundamentals of the model.
2. Profile and debug code.
3. Take advantage of the parallel structure of most economic problems.

We have attached a rough draft of the web class by Stachurski and Sargent (it is being revised and improved weekly and will be more complete by January 2014).