MACROECONOMETRICS, FALL 2019

Homework 1. Due Monday September 9.

1. Assume that a data series is the sum of a random walk and a first order moving average. Write down the process and its difference.

2. Put the process in state-space form.

3. Download as long a series as you can find for real quarterly U.S. GDP per capita. (I assume you would go the Bureau of Economic Analysis or maybe FRED.)

3. Assume that the log of the data follows the process described in part 1. Use the Kalman Filter to estimate the three parameters of the model from the difference of log data.

5. Use the Kalman Smoother to extract the random random walk and moving average components. You can adapt the posted Matlab code or the older Gauss code (not for this exact model, but the loops are the same, that is the beauty of it). You can also download code from somewhere else, but it has to be in a matrix language and not a canned program where you "write 'Kalman' and out it comes."

You can do the coding together if you wish, but make sure to understand the code (even if you are not yet fully comfortable with the theory). The Kalman Filter has a lot of applications so you are more likely than not to need it in the future.