Computational Methods: Task list 1

To be handed in by February 7, 2020

1) **Empirical validation of RBC Model**

Consider the model that is implemented in the Dynare file rbc1.mod.

a) Download the following US data series from the Fred data base:
   - Real GDP (call it Y)
   - Real private consumption (call it C)
   - Real Gross Private Domestic Investment (series GPDIC1), (call it I)
   - total private employment (series USPRIV), as a proxy for labor input, (call it L)

   Take all data as quarterly and seasonally adjusted for the time period 1949 to 2018.

b) Compute an estimate of real capital by the formula

$$K_t = (1-\delta)K_{t-1} + I_t \tag{1}$$

   with $\delta = 0.025$ and set initial capital K_0 to 10 times quarterly GDP of the beginning of the sample.

c) Take logs of each of the five data series Y, C, I, L, K.

d) Use the parameter α from the Dynare file, and compute the Solow residuals

$$\log z_t = \log Y_t - \alpha \log K_{t-1} - (1-\alpha)\log L_t \tag{2}$$

e) Compute detrended series as the deviations from the Hodrick-Prescott filtered logs, with smoothing parameter $\lambda = 1600$. For this, use the provided Matlab file hpfilter.m. More precisely, the detrended series of any x in (Y, C, I, L, K, z) is given by

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xDetrended = log(x) - hpfilter(log(x),1600)
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f) Estimate an AR(1) process for detrended z.

g) Compute for each of the detrended Y, C, I, L, K, z the following statistics
   - standard deviation
   - standard deviation, relative to the standard deviation of Y
   - autocorrelation
   - correlation with Y

h) Solve the RBC model with the parameters provided in rbc1.mod. Simulate a long data series using normal random variables (command 'randn') with the Matlab file 'simdynare.m'.
   To obtain the standard deviations of the percentages (comparable to the logarithms of the data), divide the simulated series of each variable by the respective steady state value.
   Detrend each series with the HP filter, using smoothing parameter 1600.
   Compare the data statistics with the model statistics and evaluate what is a success and what is a failure of the model.

Do all the calculations in matlab files, and hand in the files electronically.