Problem Set 4

The goal of this homework is to guide you through some key steps of estimating and identifying a VAR. We shall attempt to replicate some key results from Jonas Fisher "The Dynamic Effects of Neutral and Investment-Specific Technology Shocks", Journal of Political Economy, 2006.

Question 1

Put together a dataset for replication. For each of the series below collect as many observations as are available.

From the Labor Productivity and Costs database of the Bureau of Labor Statistics (see http://www.bls.gov/lpc/), collect:

1. labor productivity for the non-farm business sector;
2. hours worked;
3. the price deflator for output of the non-farm business sector.

From NIPA Table 1.1.4 (see http://www.bea.gov/national/nipaweb/SelectTable.asp), collect the price deflator for investment in equipment and software (line 11).

From the Labor Force Statistics database of the Bureau of Labor Statistics download the civilian non-institutional population 16 years and older. See http://www.bls.gov/cps/#data

You might consider organizing your data in a spreadsheet to keep track of all the download information such as the labels for the series in the source databases as well as the download dates.

Question 2

Prepare your data for running the VAR estimates. Import the data in Matlab or in your preferred statistical software. Focus on the sample from the third quarter of 1983 till the third quarter of 2008 (so as to exclude the Volker disinflation and the recent liquidity trap).

Take the log of all of the series in the dataset. Create the following series:

1. the quarterly rate of change of equipment investment prices normalized by the deflator for the non-farm business sector;

2. the quarterly rate of change of labor productivity;

3. hours worked per capita (subtract the log of the civilian non-institutional population from the log of hours worked).

Demean all series.

Question 3

Estimate a VAR(4) for the three variables constructed above, arranged strictly in that order.

Question 4

Identify the VAR imposing that an investment shock (the first shock in the VAR) is the only shock that affects the price of investment in the long run. Also impose that the only shocks that affect the level of labor productivity in the long run are an investment shock and a neutral technology shock (the second shock in the VAR).

Question 5

Form point estimates for the response to an investment shock of the *level* of the price of investment, the *level* of labor productivity, hours worked, and the level of output per capita in the non-farm business sector.

Hint: the response for the level of the price of investment can be obtained as the cumulative sum of the response for the growth rate growth rate (see the Matlab command **cumsum**). The output level can be calculated as the sum of the response for the level of productivity and hours worked per capita.

Question 6

Form point estimates for the response to a neutral technology shock of the *level* of the price of investment, the *level* of labor productivity, hours worked, and the level of output per capita in the non-farm business sector.

Question 7

Compute 90% bootstrap confidence interval for all the responses in Questions 5 and 6.

Question 8

Form your estimates of the identified shocks.

Question 9

Starting from initial observations equal to zero, construct counterfactual series for the observed variables turning on only one of the identified shocks at a time.

Also construct counterfactual series for the observed variables using all shocks but setting the initial observations equal to zero.

For each counterfactual experiment, back out the level of output.

Using these counterfactual experiments, compute an estimate for the fraction of the variance for the level of output and hours worked (both at business cycle frequencies) explained by each of the shocks. If y_i is the counterfactual series obtained turning on shock i only and y_a is obtained turning on all shocks, then the estimate can be formed as $VAR(HP(y_i))/VAR(HP(y_a))$, where $HP(.)$ denotes deviation from trend implied by the Hodrick-Prescott filter with smoothing parameter set at 1600. You can download a matlab implementation of the Hodrick-Prescott filter from http://ideas.repec.org/c/dge/qmrbcd/1.html.