

# Applied Macroeconomics - FAECO

## Practical Session L6

**Today's aims: (i) estimate VAR models; (ii) perform Granger causality tests; (iii) generate impulse response functions.**

The dataset is available on MSTEAMS under the name: usmacro.dta

Alternatively, you can import the data from the Excel spreadsheet and then re-create the time variable using the following commands:

```
. drop time  
. generate time=q(1959q1)+_n-1  
. format time %tq  
. tsset time
```

**TASK>** We want to investigate the dynamic interactions of investment, income and consumption in the United States. To do that, we carry out a vector autoregressive (VAR) model analysis using the first differences of log real investment (dlrinv), log real income (dlrgdp) and log real consumption (dlrcons) over the period 1959Q1 to 2005Q4 (all variables expressed in percentage points).

(1) Perform the Augmented Dickey Fuller (ADF) test to confirm that the three variables are stationary. *Note: For simplicity, include 12 lags to perform the test for each variable.*

(2) Using the 'varsoc' command and diagnostic checks on the residuals, determine the optimal lag length for the VAR model.

(3) Estimate the reduced-form VAR model using the number of lags chosen in part (2) and run all the possible Granger causality tests. Discuss the Stata output.

```
. var dlrinv dlrgdp dlrcons, lags(?)
```

(4) Suppose that we are interested to see: (i) how the growth rate of consumption responds to a one time positive shock in the growth rate of income; (ii) how the growth rate of investment responds to one time positive shock in the growth rate of consumption. Generate the orthogonalized impulse response functions and discuss the corresponding Stata graphs.

(5) Estimate an exactly-identified structural VAR (SVAR) with an  $dlrinv \Rightarrow dlrgdp \Rightarrow dlrcons$  ordering; that is, assume that: (i) percentage changes in investments are not contemporaneously affected by consumption or income; (ii) percentage changes in income is affected by contemporaneous changes in investments but not consumption; (iii) percentages changes in consumption are affected by contemporaneous changes in both investments and income. *Note: This implies setting all the elements above the main diagonal (in the matrix with the direct contemporaneous effects) equal to zero.*

```
. matrix A = (? \ ? \ ?)  
. matrix B = (? \ ? \ ?)  
. svar dlrinv dlrgdp dlrcons, aeq(A) beq(B) lags(?)
```

Also, show that the following relationship holds:

$$dlrcons = 0.06dlrinv + 0.52dlrgdp$$