MACROECONOMETRÍA

Segundo Cuatrimestre (curso 2007/08), Depto. de Economía, UC3M

Excercise set 4

Question 1. The EViews code below estimates a possible cointegration relation $y_t = \alpha_0 + \alpha_2 x_t + u_t$ and stores the disequilibrium estimates $\hat{u}_t$ in a series called *diseq*, which is short for "disequilibrium". Run the code on two variables y_t and x_t of your choice and then test for cointegration by testing whether there is a unit-root in the estimates $\hat{u}_t$. The EViews code:

```
'clear residual series:
resid = na

'estimate possible cointegration relation:
equation coint01.ls(h) y c x

'generate disequilibriums:
series diseq = resid
```

Question 2. The purpose of this exercise is to give some hints about how the final part of the project, that is, the analysis of an impact on household consumption of a tax reduction that raises disposable income by 10%, can be implemented. Let Y_t and y_t denote disposable income and its log-transformation, respectively. If r is a number close to zero, say, 0.10, then

$$\log[Y_t \cdot (1+r)] \approx y_t + r. \tag{1}$$

For example, if Y_t increases with 10%, that is, we multiply Y_t by means of 1.1, then

$$\log[Y_t \cdot (1+0.1)] \approx y_t + 0.1.$$

A useful consequence of this is that

$$\begin{aligned} \Delta \log[Y_t \cdot (1+r)] &= \log[Y_t \cdot (1+r)] - \log[Y_{t-1} \cdot (1+r) \\ &\approx y_t + r - y_{t-1} - r \\ &= \Delta y_t \end{aligned}$$

In other words, multiplying Y_t by means of $1+r$ has either very little (as long as r is close to zero) or no effect on Δy_t. This is of course apart from the period in which the tax reduction is introduced by the Government. In the period in which the tax reduction is introduced we have that

$$\begin{aligned} \log[Y_t \cdot (1+r)] - \log Y_{t-1} &\approx y_t + r - y_{t-1} \\ &= \Delta y_t + r. \end{aligned}$$

Now, consider the estimated cointegration relation

$$c_t = 5.42 + 0.77y_t + \hat{u}_t,$$

where c_t is the natural logarithm of household consumption. This means the estimated disequilibriums are $\{\hat{u}_t\}$. The series

$$\hat{u}_t^* = c_t - 5.42 - 0.77 \cdot (y_t + r)$$

can be created in a very simple way, namely by subtracting $0.77r$ from $\hat{u}_t$. That is, we have the relation

$$\hat{u}_t^* = \hat{u}_t - 0.77r.$$

Use these results to create $\{\hat{u}_t^*\}$ by means of the following code in EViews:

```
'create adjusted disequilibrium series:
series diseq_star = diseq - 0.77*0.1
```

(The number 0.77 must of course be replaced with your own estimate.)

Question 3. Let $y_t \sim I(1)$, $x_t \sim I(1)$ and consider the specification

$$\begin{aligned} y_t &= 0.2 + 0.6x_t + u_t \\ u_t &\sim WN(0, \sigma^2) \end{aligned} \tag{2}$$

a) Explain why (2) is a cointegration relation. For which values of y_t does equilibrium occur? Suggest a definition of y_t being "close" to equilibrium.

b) According to the Granger representation theorem the relation (2) can be represented as an Equilibrium Correction Model (EqCM).[1] Give such an EqCM. What is the short term dynamics, the long-term solution and the value of the disequilibrium adjustment coefficient?

Question 4. Consider the EqCM

$$\Delta c_t = 0.2 + 0.4\Delta c_{t-1} + 0.5\Delta x_t - 0.8(c_{t-1} - 0.4 - 0.9x_{t-1}) + \epsilon_t \tag{3}$$

where $c_t \sim I(1)$, $x_t \sim I(1)$ and $\epsilon_t \sim WN(0, \sigma^2)$.

a) Rewrite (3) as an ARDL(p, q) model. What are the orders of p and q?

[1]This type of model is sometimes referred to as an Error-Correction Model (ECM)

b) Compute the conditional forecasts $E(c_{100+K}|I)$ for $K = 1, 2, 4$, where $I = \{x_{104}, x_{103}, x_{102}, x_{101}, c_{100}, x_{100}, \epsilon_{100}, c_{99}, x_{99}, \epsilon_{99}, \ldots\}$, and where $c_{99} = 1$, $c_{100} = 1$, $x_{100} = 0.5$, $x_{101} = 0.6$, $x_{102} = 0.7$, $x_{103} = 0.8$ and $x_{104} = 0.9$. (The assumption that the values of x_t are known over the forecast period is useful in conditional forecasting and in counterfactual analysis, for example in your project on household consumption and disposable income.)