MACROECONOMETRÍA

Segundo Cuatrimestre (curso 2006/07), Depto. de Economía, UC3M

Excercise set 2

Question 1. The code below runs three Augmented Dickey-Fuller (ADF) tests—with q lags—for $I(1)$ stationarity on the series "cons", which is short for consumption. Run the same code on your consumption series. (Alternatively, make a similar program in your preferred software and then run it.) Provide the Teaching Assistant (TA) with a summary of the tests. Do the tests suggest your series is $I(1)$?

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'test for unit root:
cons.uroot(adf,dif=1,lag=q)
cons.uroot(adf,dif=1,const,lag=q)
cons.uroot(adf,dif=1,const,trend,lag=q)
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Question 2. Let y_t be a stationary transformation of your consumption series and estimate the model

$$y_t = \beta_0 + \beta_1 y_{t-1} + \beta_1 y_{t-2} + \beta_1 y_{t-3} + \beta_1 y_{t-4} + e_t.$$

Summarise the estimation output and provide residual diagnostics on autocorrelation, ARCH and normality. Do the diagnostics suggest that the residuals are Gaussian white noise?

Question 3. Construct a general unrestricted model (GUM) that nests the specifications a) to f), and give the restrictions on the GUM necessary to obtain a) to f). Note: Both y_t and x_t are are stationary.

a) $y_t = -0.20(y_{t-1} + y_{t-3}) + \epsilon_t$

b) $y_t = 0.30 + 0.10 y_{t-2} + 0.60 y_{t-4} + \epsilon_t$

c) $y_t = 0.1 \sum_{j=1}^{4} y_{t-j} + \epsilon_t$

d) $y_t = 0.5 + 0.3(\Delta y_{t-1} + 2\Delta y_{t-3}) + \epsilon_t$

e) $y_t = -0.10 + 1.30(2x_t + x_{t-4}) + \epsilon_t$

f) $y_t = 0.10 y_{t-1} + 0.50 \Delta x_t + 0.25 \Delta x_{t-4} + \epsilon_t$

Question 4. Let y_t, x_t, $s_{2,t}$, $s_{3,t}$ and $s_{4,t}$ denote stationary variables, and consider the two specifications

$$\begin{aligned} y_t &= \beta_0 + \beta_1 y_{t-1} + \beta_2 y_{t-2} \beta_3 y_{t-3} + \beta_4 y_{t-4} \\ &\quad + \beta_5 x_t + \beta_6 s_{2,t} + \beta_7 s_{3,t} + \beta_8 s_{4,t} + \epsilon_{A,t}, \qquad \epsilon_{A,t} \sim IN(0, \sigma_A^2) \end{aligned} \tag{1}$$

$$\begin{aligned} y_t &= \beta_1 (y_{t-1} + 2y_{t-2} + 3y_{t-3} - 6y_{t-4}) \\ &\quad + \beta_5 x_t + \beta_6 [s_{2,t} + 2(s_{3,t} + s_{4,t})] + \epsilon_{B,t}, \qquad \epsilon_{B,t} \sim IN(0, \sigma_B^2) \end{aligned} \tag{2}$$

Specification (2) is nested in (1), so (2) is therefore a restricted version of (1). What are the linear restrictions on (1) needed in order to obtain (2)? Suppose ordinary least squares (OLS) estimation of (1) produces a sum of squared residuals (SSR) of 0.007428, and that OLS estimation of (2) produces an SSR of 0.014505, both estimated on the same data with a sample size of $T = 100$. Are the restrictions implied by (2) valid at 10%? At 5%? At 1%?