MACROECONOMETRÍA

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Excercise set 1

Question 1. Replace the Excel file "datos.xls" in the EViews program below with your own Excel file containing a quarterly household consumption series of your country of choice, and then change the EViews program as needed before running it. (Alternatively, make a similar program in your preferred software and then run it.) Provide the Teaching Assistant (TA) with a printout of your program and a printout of the graph of your consumption series.

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'create workfile with quarterly frequency:
workfile proyecto.wf1 q 1970:1 2008:4

'import data (1 series, first observation in b2):
read(b2) datos.xls 1

'make graph of consumption series:
graph consumo.line oe_esp_cpvq
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Question 2. Let $\{Y_t\}$ be a stationary process, that is, $E(Y_t) = \mu$ and $Cov(Y_t, Y_{t-k}) = \gamma_k$ for all t. Show that the series $\{\Delta Y_t\}$ also is stationary. [Hint: In the process you will need to show that $E(Y_t Y_{t-k}) = \gamma_k + \mu^2$ and then use this property.] Suggest at least one situation in which it can be useful to apply the difference operator Δ on a series although it is already stationary. [Hint: Read section 7.10 in Patterson (2000), *An Introduction to Applied Econometrics*, Palgrave.]

Question 3. Consider the model

$$Y_t = 0.6 + 0.3t + \epsilon_t + 0.5\epsilon_{t-1}, \tag{1}$$

where $\{\epsilon_t\}$ is White Noise with $E(\epsilon_t) = 0$ and $\sqrt{Var(\epsilon_t)} = 0.9$.

a) What kind of model is (1)? Compute $E(Y_t)$ and $Cov(Y_t, Y_{t-k})$. Is $\{Y_t\}$ stationary?

b) Define $Z_t = Y_t - E(Y_t)$, and compute $E(Z_t)$ and $Cov(Z_t, Z_{t-k})$. Is the series $\{Z_t\}$ stationary?

c) Write the specification of ΔY_t, and compute $E(\Delta Y_t)$ and $Cov(\Delta Y_t, \Delta Y_{t-k})$. Is the series $\{\Delta Y_t\}$ stationary?

d) Is the model ΔY_t invertible?

Question 4. Let $\{Y_t(q)\}$ be a quarterly series where $Y_{t(1)}$, $Y_{t(2)}$, $Y_{t(3)}$ and $Y_{t(4)}$ denote the values of the first, second, third and fourth quarter, respectively, in year t. Now, suppose $E(Y_{t(1)}) = \mu_1$, $E(Y_{t(2)}) = \mu_2$, $E(Y_{t(3)}) = \mu_3$ and $E(Y_{t(4)}) = \mu_4$ for all t where $\mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_4$. Can $\{Y_{t(q)}\}$ be a stationary series? If not, suggest a possible solution.

Question 5. Consider the ARIMA$(0, 1, 2)$ model

$$\Delta Y_t = \phi_0 + \epsilon_t + \theta_1 \epsilon_{t-1} + \theta_2 \epsilon_{t-2}. \tag{2}$$

a) Show that the k-step ahead expression of Y_t, that is, Y_{t+k}, is given by

$$Y_{t+k} = k \cdot \phi_0 + Y_t + \sum_{i=1}^{k} e_{t+i},$$

where $e_{t+i} = \epsilon_{t+i} + \theta_1 \epsilon_{t+i-1} + \theta_2 \epsilon_{t+i-2}$.

b) Compute the conditional forecast function $E(y_{t+k}|I_t)$, where I_t is the conditioning information up to and including t.

c) What are the expressions for the deterministic component (the deterministic trend), the permanent component (the stochastic trend) and the transitory component (the stationary or cyclical component) in a Beveridge-Nelson decomposition?

d) Suppose $\theta_1 = \frac{1}{2}$, $\theta_2 = \frac{1}{3}$, $\epsilon_t = 1$, $\epsilon_{t-1} = -\frac{2}{3}$ and $Y_t = 10$. What are the values of the permanent and transitory components?