MACROECONOMETRÍA

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Excercise set 3

Question 1. Let c_t denote the log of consumption, and let $q_{2,t}, q_{3,t}$ and $q_{4,t}$ be seasonal dummies for quarter 2, 3 and 4, respectively. Estimate the specification

$$\Delta c_t = \beta_0 + \beta_1 \Delta c_{t-1} + \beta_2 \Delta c_{t-2} + \beta_3 \Delta c_{t-3} + \beta_4 \Delta c_{t-4} + \beta_5 q_{2,t} + \beta_6 q_{3,t} + \beta_7 q_{4,t} + e_{1,t}$$

using the code:

equation eq01.ls(h) dc c dc(-1) dc(-2) dc(-3) dc(-4) @seas(2) @seas(3) @seas(4)

Does the estimation output suggest that the residuals are White Noise?

Question 2. Let c_t denote the log of your consumption series, and estimate the model (which contains an LSTAR term)

$$\Delta c_t = \beta_0 + \frac{\beta_1}{1 + \exp[-\beta_2(t - \beta_3)]} + \beta_4 q_{2,t} + \beta_5 q_{3,t} + \beta_6 q_{4,t} + \epsilon_t$$

using the following code:

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'create series called 'time':
series time = @trend + 1

equation eq03.ls(h) y = c(1) + c(2)*(1/(1 + exp(-c(3)*(time - c(4)))))
+ c(5)*@seas(2) + c(6)*@seas(3) + c(7)*@seas(4)
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EViews makes use of a non-linear estimation algorithm. Does the iterative procedure converge? If so, on what date does the estimate of β_3 suggest there is a structural break in the intercept β_0? Do the estimates suggest the break is significant?

Question 3. Let y_t denote the percentage change in the Euro versus US Dollar exchange rate (the number of Euros per US Dollar) from the end of one day to another, and consider the following ARCH(1) model

$$\begin{aligned} y_t &= \beta x_t + e_t, \quad e_t = \sigma_t z_t, \quad z_t \sim IIN(0,1) \\ \sigma_t^2 &= \omega + \alpha e_{t-1}^2 + \delta x_{t-1}^2 \end{aligned}$$

a) Let $\omega > 0$, $\alpha = 0$ and $\delta > 0$. Are the errors $\{e_t\}$ conditionally heteroscedastic? Justify your answer. Give an economic interpretation of the values $\beta < 0$ and $\delta > 0$.

b) Consider now the model

$$y_t = 0.1 + 0.7y_{t-1} + e_t, \qquad e_t = \sigma_t z_t, \qquad z_t \sim IID(0,1)$$
$$\sigma_t^2 = 0.4 + 0.2e_{t-1}^2.$$

Determine if it is stable and compute $E(y_t)$ y $Var(e_t)$

c) Given the model in *b*), suppose that $y_{100} = 0.2$ and that $e_{100} = 1$. Compute $E(y_{101}|y_{100}, e_{100}, \ldots)$ and $Var(e_{101}|y_{100}, e_{100}, \ldots)$. How much do the conditional forecasts differ from the unconditional forecasts?

Question 4. Let y_t be quarterly real consumption (that is, $y_t = \frac{C_t}{P_t}$ where C_t is nominal consumption and P_t is a price index) and consider the GARCH(1,1) model

$$y_t = \beta_0 + \beta_1 y_{t-1} + e_t, \qquad e_t = \sigma_t z_t, \qquad z_t \sim IIN(0,1)$$

$$\sigma_t^2 = \omega + \alpha e_{t-1}^2 + \gamma \sigma_{t-1}^2 + \delta q_{4,t}$$

where $q_{4,t}$ is a seasonal dummy for the fourth quarter.

a) Let $\omega > 0$, $\alpha = \gamma = 0$ and $\delta > 0$. Are the errors $\{e_t\}$ conditionally heteroscedastic? Justify your answer. Give an economic interpretation of the values $\beta_1 > 0$ and $\delta > 0$.

b) Let $y_{100} = 0.8$, $\beta_0 = 1$, $\beta_1 = 0.1$, $\omega = 0.3$, $\alpha = 0.2$, $\delta = 0$, $q_{4,102} = 1$, $\sigma_{100} = 0.6$ and $z_{100} = 0.4$. Is the model stable? Suppose now that $\gamma = 0.3$ and that $\delta = 0.1$. Compute $E(y_{100+L}|I_{100}, I_{99}, \ldots)$ and $Var(y_{100+L}|I_{100}, I_{99}, \ldots)$ for $L = 1$, $L = 2$ and $L = 4$, where $I_t = \{y_t, \sigma_t, z_t\}$.