Exercise: Conditional vs unconditional expectations in RE models

Macroeconomics (M8674), May 2024

Vivaldo Mendes, ISCTE

vivaldo.mendes@iscte-iul.pt

An uncoupled model with RE: Questions

Consider a simple model described by the following three equations:

$$y_t = \beta \mathbb{E}_t y_{t+1} + x_t \tag{1}$$

$$x_t = \phi + \rho x_{t-1} + \varepsilon_t \ , \quad \varepsilon_t \sim \mathcal{N}\left(0, \sigma^2\right) \tag{2}$$

$$z_t = \sigma + \mu y_t \tag{3}$$

where $\{\beta, \phi, \rho, \sigma, \mu\}$ are parameters.

1. *What kind of variables (forward-looking, backward-looking, and static) do we have in this model?*
2. *To secure one stable solution for this model, what are the constraints that we have to impose upon the parameters?*
3. *Solve for the model's deterministic steady-state (or long-term equilibrium).*

4. *Given the following parameters, what are the long-term equilibrium levels of y_t, x_t and z_t, according to the hypothesis of **conditional expectations**?*

$$\beta = 0.75 \ , \ \phi = 10 \ , \ \rho = 0.5 \ , \ \sigma = 2 \ , \ \mu = 0.1$$

5. *Now consider that the system is in its long-term equilibrium. If in a given period t, x_t suffers a shock equal to $\varepsilon_t = +1$ (no more shocks afterward), what happens to x_t, y_t, and z_t? And what will their values be in $t + 1$?*

6. *Considering the same shock and the same parameters as above, what happens to y_t, x_t, and z_t, according to the hypothesis of **unconditional expectations**?*

7. *When will the two solutions (under conditional and unconditional expectations) be the same?*