

Assignment 9

due: Tuesday, May 22, in class

Problem 1: Consider the difference equation $x_{t+1} = ax_t + b$.

- Explicitly solve the difference equation.
- Substitute $y_t = x_t - b/(1 - a)$, solve the resulting difference equation in y , and express the solution in terms of x to doublecheck your result from a).
- Analyze the stability properties of the equation distinguishing all possible cases.

Problem 2: A student's grade in the current semester, g_t , depends positively on her effort level e_t . Her effort level in turn depends negatively on the grade she obtained in the previous semester, g_{t-1} .

- Set-up a simple model using linear functional forms for $g_t = f(e_t)$ and $e_t = h(g_{t-1})$ and derive a first-order difference equation in g .
- Solve the difference equation from a).
- Explain how the stability of the student's performance depends on the slopes and intercepts of $f(\cdot)$ and $h(\cdot)$.

Problem 3: Find the general solutions of

- $x_{t+2} + 2x_{t+1} - 8x_t = 10$
- $x_{t+2} + 2x_{t+1} + x_t = 9 \times 2^t$
- $x_{t+2} + 2x_{t+1} + 3x_t = 0$