Introduction to MATLAB
HOMEWORK 1/Accumulating savings with the fixed balance strategy

You make an investment of $I = 500 EUR$ every 6 months. The investments are balanced between stocks and bonds so that the goal is to keep the stock-bond balance close to 70-30 (70% stocks, 30% bonds). How do your savings accumulate in 20 years with this strategy?

Make the following assumptions about the markets and your saving procedure:

- Let the time t be discretized to 6 month time steps,

$$0 = t_0, t_1, t_2, \ldots .$$

  Discretize your savings in stocks as, and in bonds,

$$s = s_0, s_1, \ldots, \quad b = b_0, b_1, \ldots,$$

  correspondingly.

- Market movement. The value of your previous (upto time t_{i-1}) stock investment at time $t = t_i$ is

$$p_s s_{i-1},$$

  where $p_s \sim N(\mu_s, \sigma_s^2)$ is a random variable,

$$\mu_s = 1.035, \quad \sigma_s = 0.05.$$

  Similarly, the value at time t_i for the previous bond investment is

$$p_b b_{i-1}, \quad p_b \sim N(\mu_b, \sigma_b^2), \quad \mu_s = 1.02, \quad \sigma_b = 0.01.$$

- Investment decision. At time t_i the entire investment I is done either to stocks or to bonds, depending in which way the balance will be closer to the desired stock-bond balance, i.e., either

$$\begin{cases} s_i = p_s s_{i-1} + I \\ b_i = p_b b_{i-1}, \end{cases} \quad \text{or,} \quad \begin{cases} s_i = p_s s_{i-1} \\ b_i = p_b b_{i-1} + I. \end{cases}$$

Simulate the investment strategy with an m-file. Plot the functions

$$t \mapsto s(t), \quad t \mapsto b(t), \quad t \mapsto s(t) + b(t).$$

Question for yourself (no need to return to the lecturer):
What happens when you change your stock-bond balance to 30-70, or 50-50?