Exercise 4

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1. Open the file `simulations.xlsx`. Use the sheets "AR(1)" (with ϕ_1 set to 1) to simulate a random walk with drift, and the sheet "Linear Trend" to simulate a trend-stationary process. Play with the parameters and describe your observations.

2. (a) The file `tbill.csv` contains monthly data for the 3-month T-Bill rate. Plot them, study the correlogram, and conduct a unit root test.

   (b) Model the first difference of the T-Bill rate as an ARMA process, hence modelling the T-Bill rate as an ARIMA process.

   (c) Forecast the T-Bill rate for 2022M11 and 2022M12 based on the model you found in the previous question.

3. (a) Show that for both

$$Y_{1,t} = \delta t + U_{1,t} \quad \text{and}$$
$$Y_{2,t} = \delta + Y_{2,t-1} + U_{2,t}.$$

   we have $\mathbb{E}[\Delta Y_{i,t}] = 0$.

   (b) Derive the ADF regression for an AR(2) process.