Exercise: ARIMA I

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BUS 323 - Fall 2025 - Labadie

1. Simulate and plot some data from simple ARIMA models.

   (a) Use the following R code to generate data from an AR(1) model with $\phi_1 = 0.6$ and $\sigma^2 = 1$. The process starts with $y_1 = 0$.

   ```
   y <- numeric(100)
   e <- rnorm(100)
   for(i in 2:100)
   y[i] <- 0.6*y[i-1] + e[i]
   sim <- tsibble(idx = seq_len(100), y = y, index = idx)
   ```

   (b) Produce a time plot for the series. How does the plot change as you change ϕ_1?

   (c) Write your own code to generate data from an MA(1) model with $\theta_1 = 0.6$ and $\sigma^2 = 1$.

   (d) Produce a time plot for the series. How does the plot change as you change θ_1?

   (e) Generate data from an ARMA(1,1) model with $\phi_1 = 0.6$, $\theta_1 = 0.6$, and $\sigma^2 = 1$.

   (f) Generate data from an AR(2) model with $\phi_1 = -0.8$, $\phi_2 = 0.3$, and $\sigma^2 = 1$. (Note that these parameters will give a non-stationary series.)

   (g) Graph the latter two series and compare them.