# Time Series Analytics

109-1 Homework #05
Due at 23h59, November 01 2020; files uploaded to NTU-COOL

1. (10%) The two time series plots are shown below. For each of the series, describe the sample autocorrelations $\hat{\rho}_1$ and $\hat{\rho}_2$ using the terms strongly positive, moderately positive, near zero, moderately negative, or strongly negative. Do you need to know the scale of measurement for the series to answer?
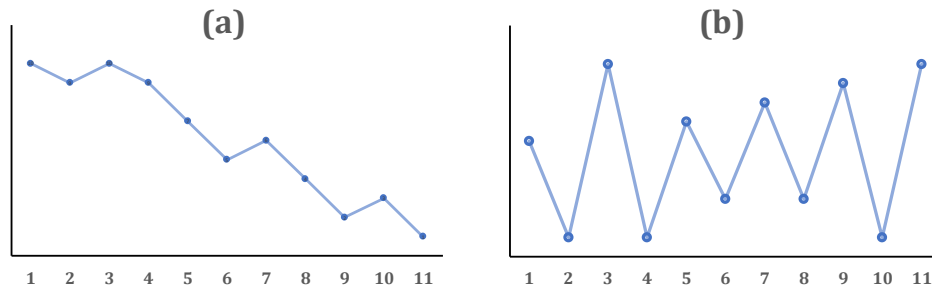
2. (15%) Identify the (p, d, q) for following ARIMA models and calculate the $E[\nabla y_t]$ and $V[\nabla y_t]$.
   (a) $y_t = 3 + y_{t-1} + a_t - 0.75a_{t-1}$;
   (b) $y_t = 10 + 1.25y_{t-1} - 0.25y_{t-2} + a_t - 0.1a_{t-1}$;
   (c) $y_t = 5 + 2y_{t-1} - 1.7y_{t-2} + 0.7y_{t-3} + a_t - 0.5a_{t-1} + 0.25a_{t-2}$.

3. (20%) Suppose that $y_t = A + Bt + x_t$, where x_t is a random walk. First suppose that A and B are constants.
   (a) Is y_t stationary?
   (b) Is ∇y_t stationary?

   Now let A and B be random variables that are independent of the random walk x_t.
   (c) Is y_t stationary?
   (d) Is ∇y_t stationary?

4. (10%) Given a stationary process y_t, show that if $\rho_1 < 0.5$, ∇y_t has a larger variance than does y_t.