Aaron Vo MA-641 HW5 March 1, 2024

1) The sample ACF + its first difference where $n = 100$

lag	1	2	3	4	5	6
ACF Y_t	.97	.97	.93	.85	.8	0.71
ACF ∇Y_t	-.42	.18	-.02	.07	-.1	-.09

↳ ARIMA(p, d, q) where p is the order of autoregressive, d is the order of differencing, and q is the order of moving average.

↳ Spike at lag 1, therefore MA's order is 1

↳ Only 1 significant spike for partial autocorrelation so AR order is 1

↳ ARIMA$(1, 0, 1)$

5) Assume that $\{e_t\}$ and $\{N_t\}$ are independent Gaussian white noise series with mean zero and variance 1. Let $\{e_t\}$ and X_t follows the series $Y_t = X_{t-1} + N_t$. What is the model for the observed time series $Y_t = X_t + e_t$.

↳ $Y_t = X_t + e_t \Rightarrow Y_t = (X_{t-1} + N_t) + e_t \Rightarrow Y_t = X_{t-1} + (N_t + e_t)$

↳ The parameters are:
- ↳ X_{t-1} : Lagged value of the latent process
- ↳ $N_t + e_t$: Sum of the white noise from random walk model and observational noise
- ↳ Since N_t and e_t have mean 0 and variance 1
- ↳ Mean : 0
  Variance : 2