Sta457 Time Series Analysis
Homework 1
Jan. 21, 2020
Due Jan. 30, 2020 in class

- You should work out this Homework individually. Group works or discussions are not acceptable.
- No late Homework will be accepted.

(1) Problem 1.4 on Page 41 of the Textbook.

(2) Problem 1.6 on Page 41 of the Textbook.

(3) Problem 1.9 on Page 42 of the Textbook.

(4) Problem 1.11 on Page 42 of the Textbook.

(5) Problem 1.15 on Page 43 of the Textbook.

(6) Consider the AR(1) process $X_t = 0.4X_{t-1} + a_t$, where (a_t) is a white noise process with mean 0 and variance σ^2. Define the sequences u_k and v_k recursively as follows:

$$\begin{aligned} u_1 &= 1, \quad u_{k+1} = u_k + k, \text{ for } k = 1, 2, \cdots, \\ v_1 &= 1, \quad v_{k+1} = v_k + (P_k + 1), \text{ for } k = 1, 2, \cdots, \end{aligned}$$

where $P_1, P_2, \cdots$, are i.i.d. Poisson random variables with mean 1. Further assume that the two processes (P_t) and (X_t) are independent.

(a) . Define $Y_k = X_{u_k}$, $k = 1, 2, \cdots$. Is (Y_k) a weakly stationary time series? Prove your conjecture.

(b) . Define $Z_k = X_{v_k}$, $k = 1, 2, \cdots$. Is (Z_k) a weakly stationary time series? Prove your conjecture.