STAT 5140/4140 (Time Series Analysis): Homework 1 Sumen Sen

Due date : Feb-04-2020

1. Let X and Y be two random variable with joint pdf $f(x, y) = 3x$ for $0 \leq y \leq x \leq 1$, and zero elsewhere.
   (a) Compute $P(0 < X < 0.5 \cap Y \geq 0.25)$
   (b) Compute marginal densities of X and Y.
2. Suppose X and Y are random variables with joint probability density function of the form $f(x, y) = x + y$, for $0 \leq x \leq 1$; and $0 \leq y \leq 1$ and zero elsewhere.
   (a) Find the marginal distribution of X and Y.
   (b) Compute $E(X)$, $E(Y)$; $Var(X)$ and $Var(Y)$.
   (c) Compute $Cov(X, Y)$.
   (d) Compute $E[(2X - Y)^2]$
3. Consider a random process $X_t = Sin(\frac{2\pi}{100}t + \phi)$.
   (a) Consider $\phi \sim Uniform(-\pi, \pi)$. Plot the process for $t \in (0, 1000)$.
   (b) Consider $\phi \sim Uniform(0, \pi)$. Plot the process for $t \in (0, 1000)$
   (c) In terms of mean, what difference you see in those plots. Explain why do you see such difference.
4. Let X is a random variable with mean 1 and variance 16, Y is a random variable with mean 3.5 and standard deviation 2; Z is a random variable with mean -2 and variance 9. Also assume The covariance between X and Y is 1.0. The correlation between X and Z is -.5 The covariance between Y and Z is 0
   (a) Compute the mean of Y+Z
   (b) Compute the variance of Y+Z
   (c) Compute the covariance of X+Y-+Z and -X+2Y-3Z

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5. It is important to get an idea about a time series by looking at the plot. I have uploaded few time series plots in D2L. In few lines write you comments for each plot.