

**Old Dominion University**  
**Mathematics-Statistics Department**  
**Fall 2011 Semester**  
**Norou Diawara**  
**Stat 630 Homework 2**

Due date: September 22<sup>nd</sup>

Explain your answers.

1. Solve Problem 1.4
2. Solve Problem 1.5
3. Solve Problem 1.6
4. Solve Problem 1.7
5. Solve Problem 1.8
6. Solve Problem 1.10
7. Solve Problem 1.11
8. Solve Problem 1.15
9. Let  $\{Z_t\}$  be a sequence of independent random variables with zero mean and unit variance. Let  $\alpha, \beta \in \mathbb{R}$ . Show that there exists a stationary process  $\{X_t\}$  satisfying  $X_t = \alpha X_{t-1} + \beta X_{t-2} + Z_t$  if the roots of the equation  $y^2 - \alpha y - \beta = 0$  are smaller than 1 in absolute value.
10. Consider the AR(1) process  $X_t = \frac{1}{2}X_{t-1} + Z_t$  where  $Z_t$  uncorrelated mean 0 and variance 1 sequence of r.v. Show that  $X_t$  defined as  $X_t = 10(\frac{1}{2})^t + Z_t + \frac{1}{2}Z_{t-1} + (\frac{1}{2})^2Z_{t-2} + \dots$  is a solution of the AR(1) equation, but it is not stationary.
11. (Bonus question) Let  $P$  be a Poisson process with mean  $\lambda$ , and let  $\alpha > 0$ . Define  $X_t = P(t + \alpha) - P(t)$ ,  $t \geq 0$ .  
Show that  $X_t$  is stationary.

There are two other interesting problems using the ITSM program that comes with the textbook. Problems 1.16 and 1.17. Please try them, but you do not have to turn them in.

Let me know if you have any questions.

### Homework 3

Consider the data set called "data electricity" which is the data electricity demand of a company, beginning January 1980. Analyze data and provide a time series model. Give the one year prediction.