

## Stat153 Assignment 1 (due September 9, 2005)

### 1. (White noise)

We have seen that i.i.d. noise is white noise. This example shows that white noise is not necessarily i.i.d.

Suppose that  $\{W_t\}$  and  $\{Z_t\}$  are independent i.i.d. sequences, with  $P(W_t = 0) = P(W_t = 1) = 1/2$  and  $P(Z_t = -1) = P(Z_t = 1) = 1/2$ . Define the time series model

$$\begin{aligned}X_{2t} &= W_t Z_t \\X_{2t+1} &= (1 - W_t) Z_t.\end{aligned}$$

Show that  $\{X_t\} \sim WN(0, \sigma^2)$ , but  $\{X_t\}$  is not i.i.d.

### 2. (Stationarity)

For each of the following, state if it is a stationary process. If so, give the mean and autocovariance functions. Here,  $\{W_t\}$  is i.i.d.  $N(0,1)$ .

- (a)  $X_t = W_t - 3W_{t-12}$ .
- (b)  $X_t = W_1$ .
- (c)  $X_t = W_1 t$ .
- (d)  $X_t = W_t t$ .
- (e)  $X_t = W_1 W_{t-1}$ .
- (f)  $X_t = W_t W_{t-1}$ .

### 3. (Stationarity and differences)

Shumway and Stoffer problem 1.10.

### 4. (Computer exercise: MA processes, sample ACFs and scatter diagrams)

Shumway and Stoffer problem 1.22.