PSTAT 174 Lab 2

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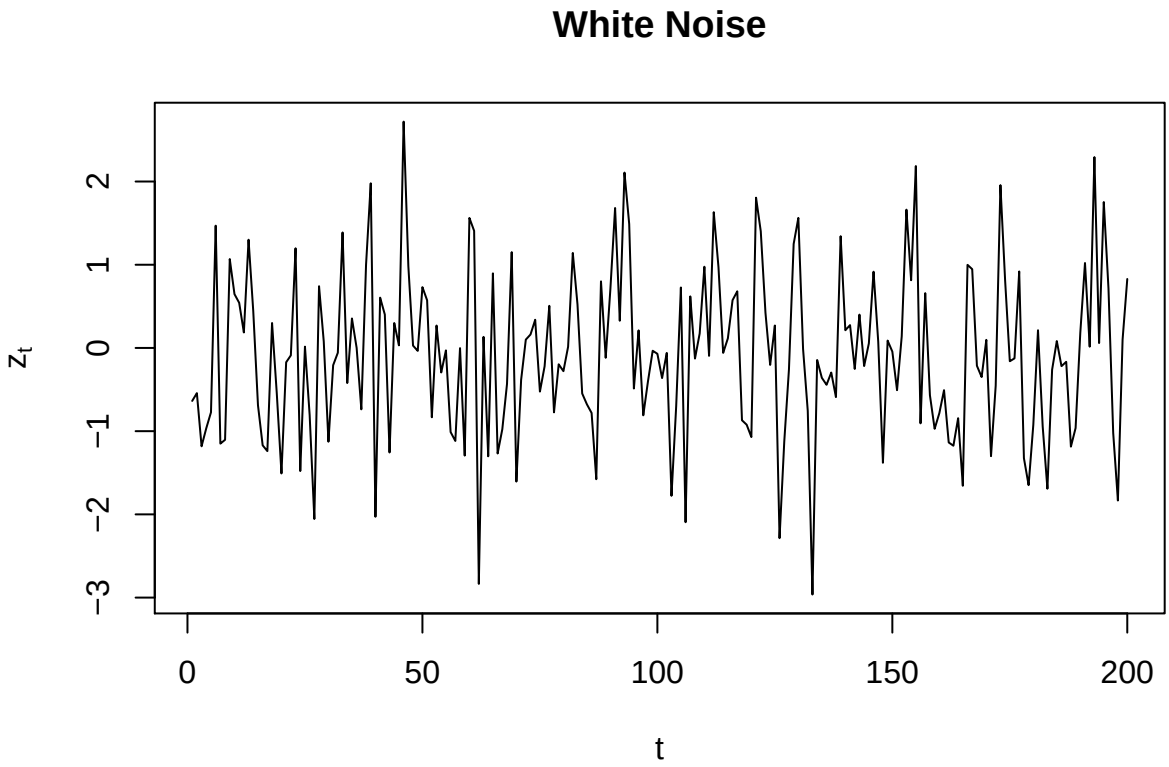
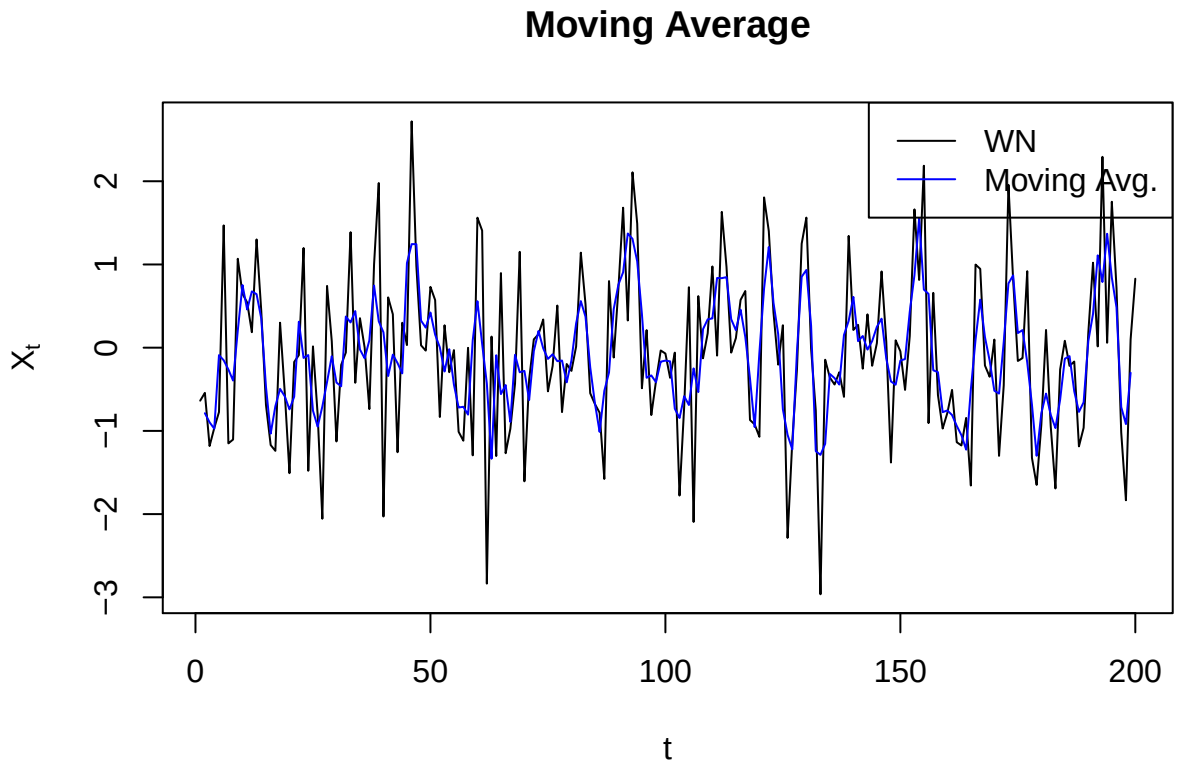
1 What is the definition of a white-noise process? Does it have to be Gaussian? The definition of a white-noise process means: the mean is zero, it has a constant variance and is uncorrelated. No, it doesn't have to be Gaussian. If the distr. is also specified as Normal and has i.i.d. RV's then it is Gaussian WN.

2 In Lab 2 question 2 Moving averages, what is the difference of yt and xt in the plot? What does this difference suggest about Moving Average as a data processing technique? Plot the acf of yt in question

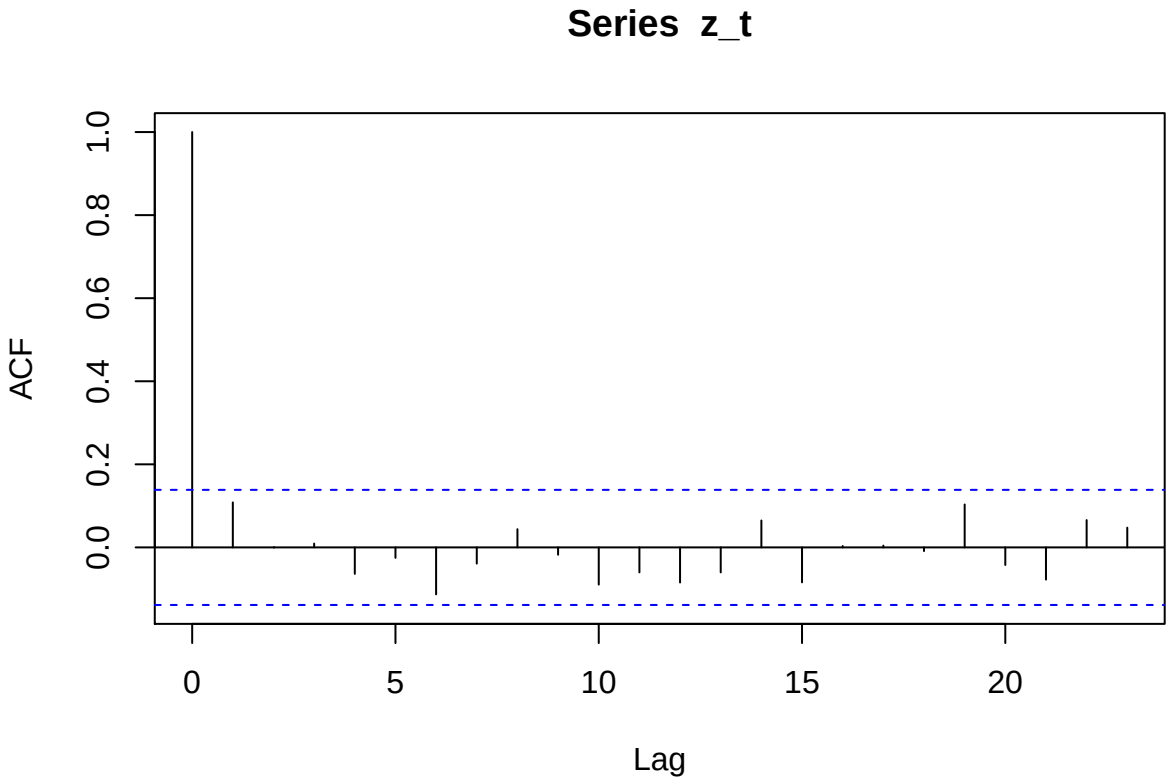
```
z_t <- rnorm(200,0,1)
plot(z_t,xlab = "t",ylab = expression(z[t]),type = "l",main = "White Noise")
```




```
y_t = filter(z_t, filter = rep(1/3,3), sides = 2, method = "convolution")
# Plot of white-noise
plot(z_t,xlab = "t",ylab = expression(X[t]),type = "l",main = "Moving Average")
# Plot of moving-average
lines(y_t,col = "blue")
# Add legend
legend("topright",c("WN", "Moving Avg."),col = c("black","blue"),lty = 1)
```



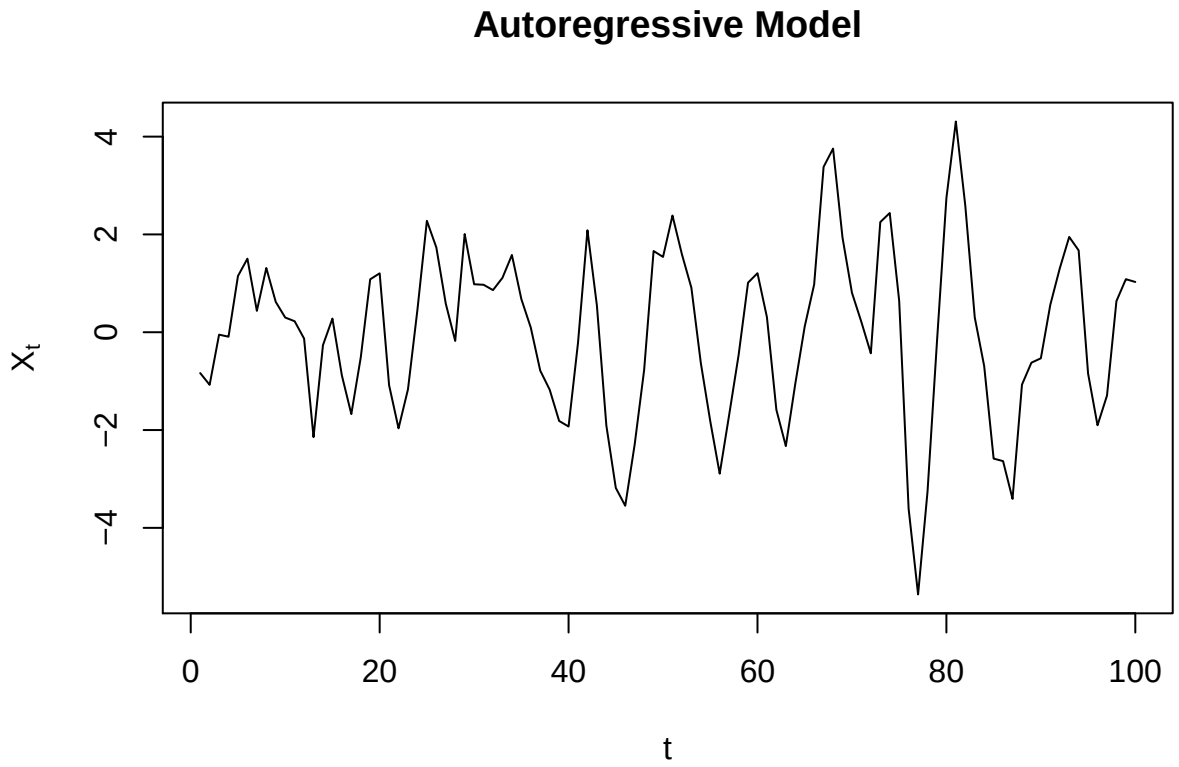

```
acf(z_t)
```



The plot of xt has more shocks than the plot of yt, which makes sense since it is a WN with independent observations. The moving average shows an average of the values and has less shocks since the current observation depends on today's shock and yesterday's shock.

3 Simulate an AR model using two different ways you learned from Lab 2. Hint: filter() and arima.sim()

```
z_t <- rnorm(100,0,1)
x_t <- filter(z_t,filter = c(1,-0.5),method = "recursive")
plot(x_t,xlab = "t",ylab = expression(X[t]),type = "l", main = "Autoregressive Model")
```




```
x1 <- arima.sim(n = 100,model = list(ma=c(1,-0.5)))
plot(x1)
```