cross correlation function

Cross correlation function

Compare uncorrelated and correlated times series with the cross correlation function:

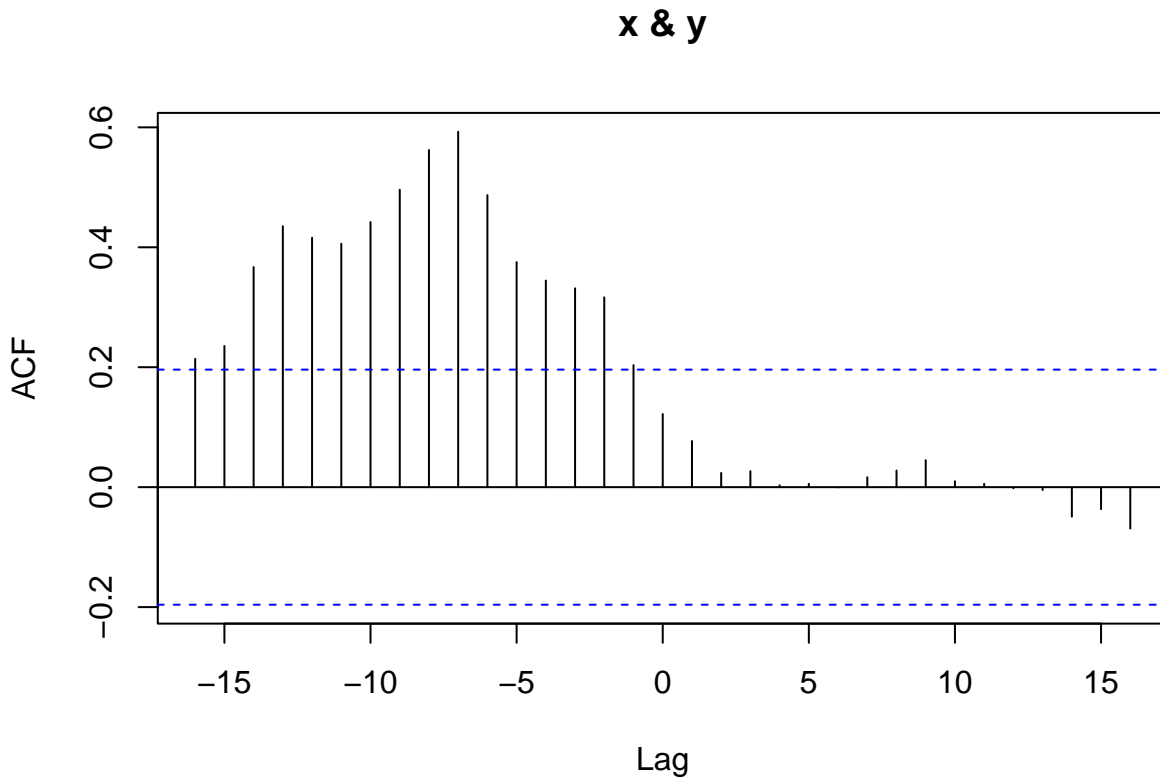First simulate correlated and uncorrelated time series data as follows:

- Simulate x and y as two independent ARMA processes. Then create z = x - y

```
x = arima.sim(model=list(ar=0.8),n=100)
y = arima.sim(model=list(ar=0.8),n=100)
z = x-y
```

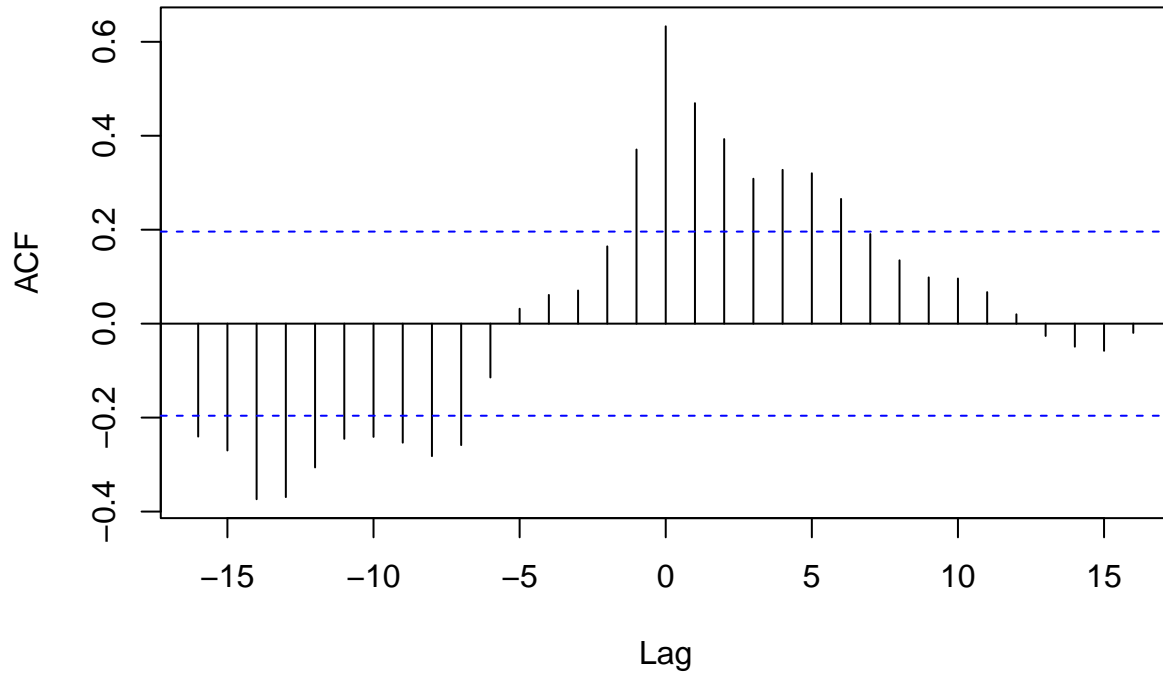Then x and y are uncorrelated, but z is correlated with both x and y.

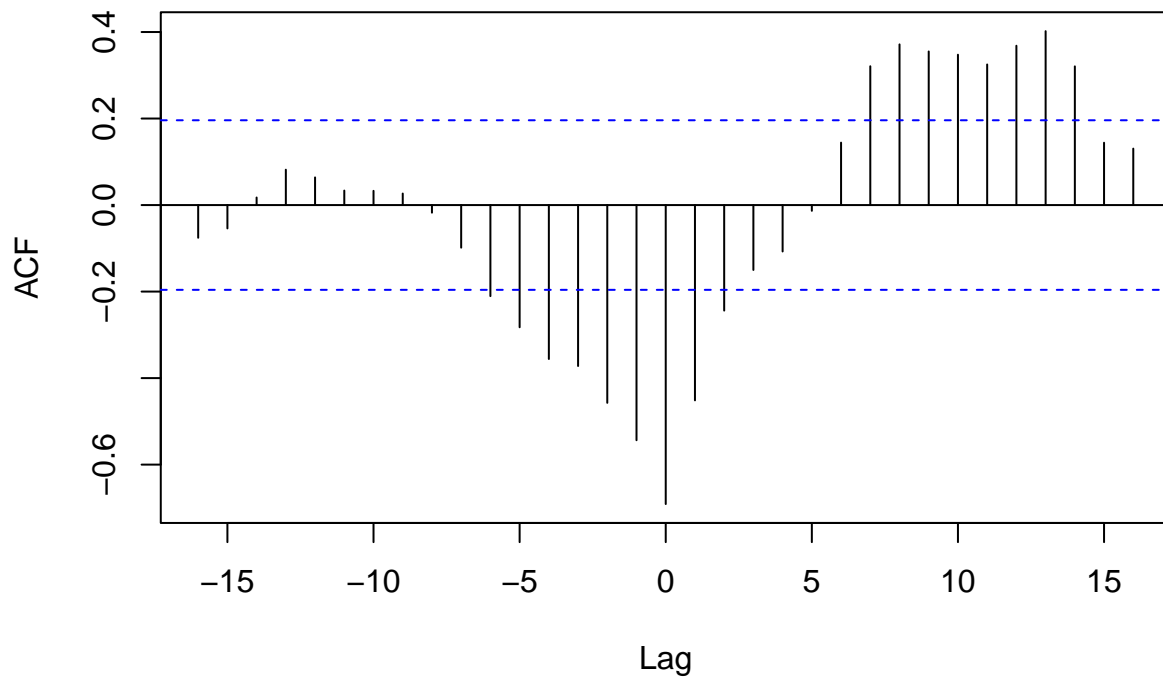- Make cross correlation plots comparing the processes, and inverpret.
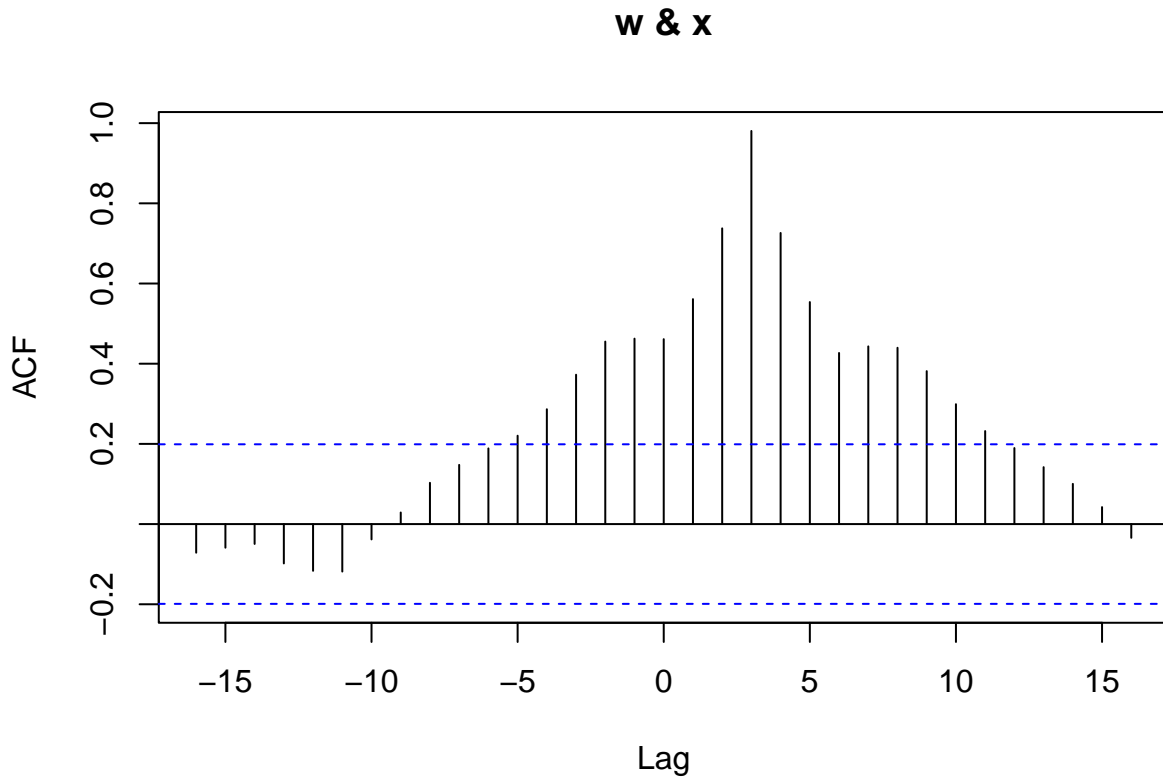
```
ccf(x,y)
```

x & y

x & z

y & z
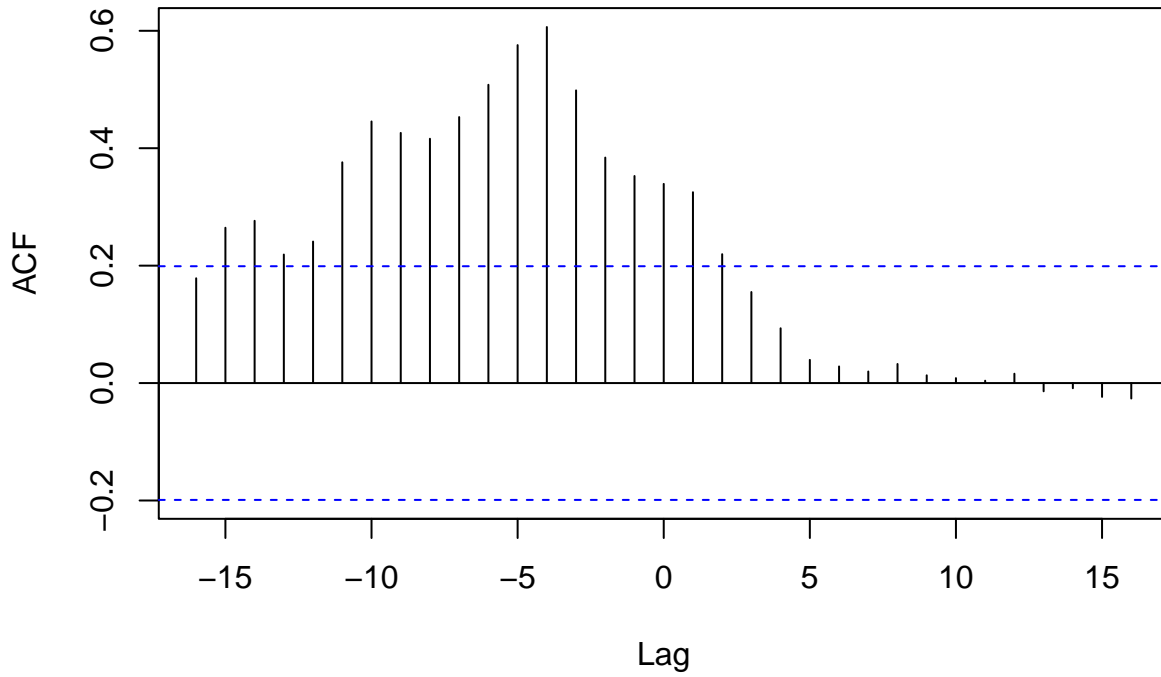

- Construct a new process w as a delayed version of x.

- Draw the cross-correlation plots comparing w with x,y and z, resepctively. Can you identify the delay from the ccf?
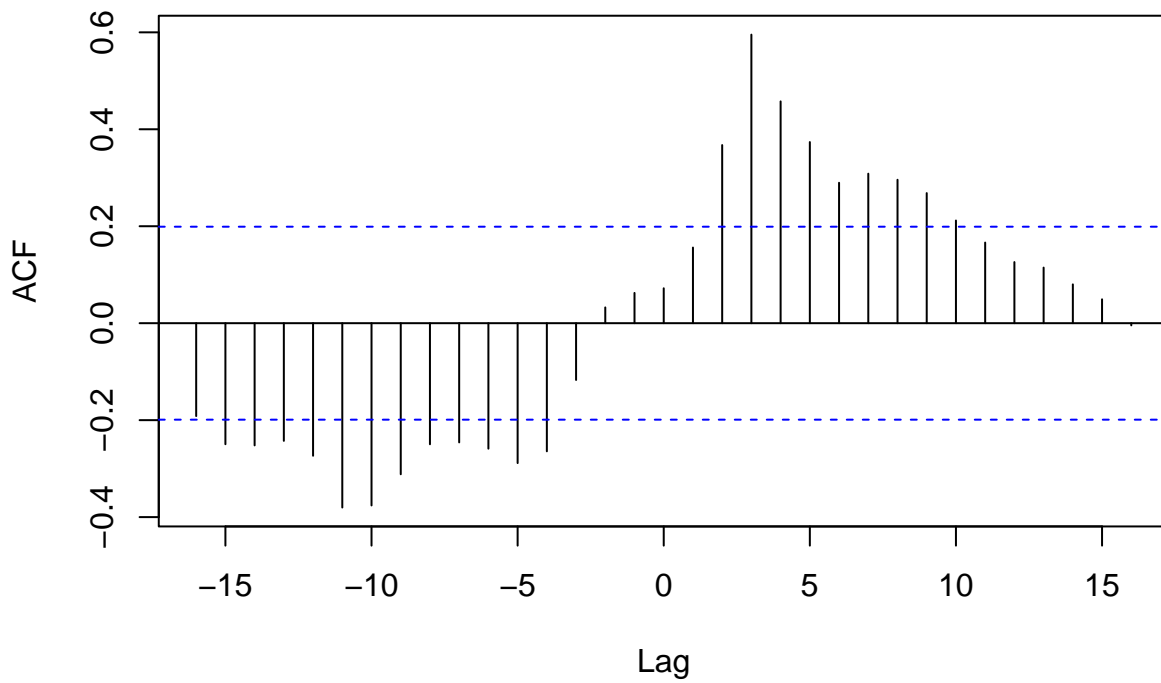
```
w = lag(x,-3)
ccf(w,x)
```

w & x


```
ccf(w,y)
```

w & y

```
ccf(w,z)
```


w & z

The largest ccf appears at lag 3 for both x and z. x is independent of y, hence so is y. Therefore, we do not see the lag in the ccf.