STAT 4600 Final

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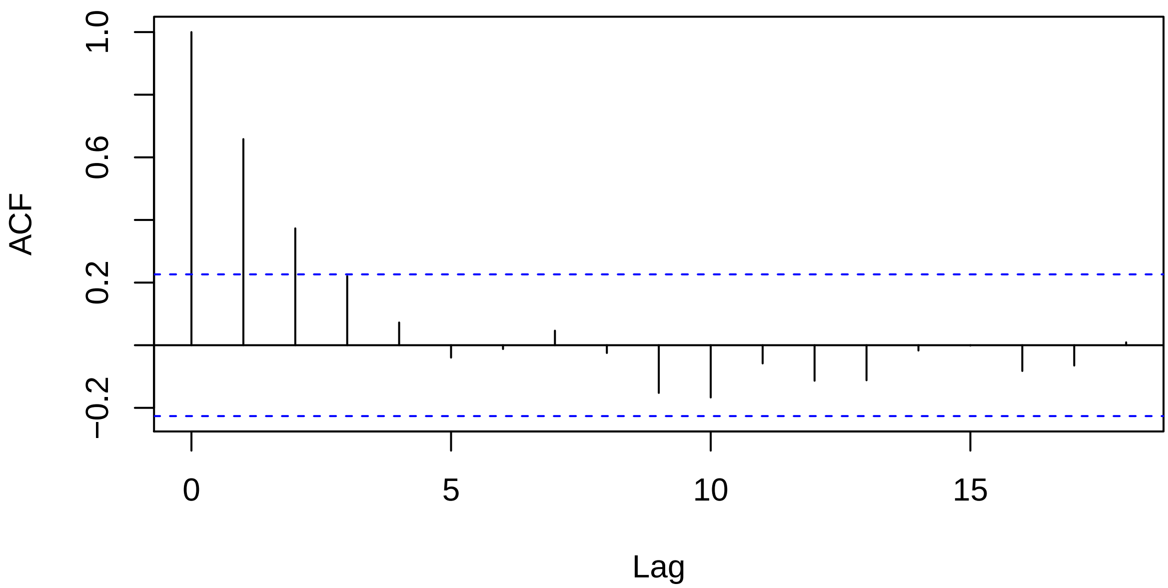
10.16

a)

First, looking at a plot of the auto-correlation function

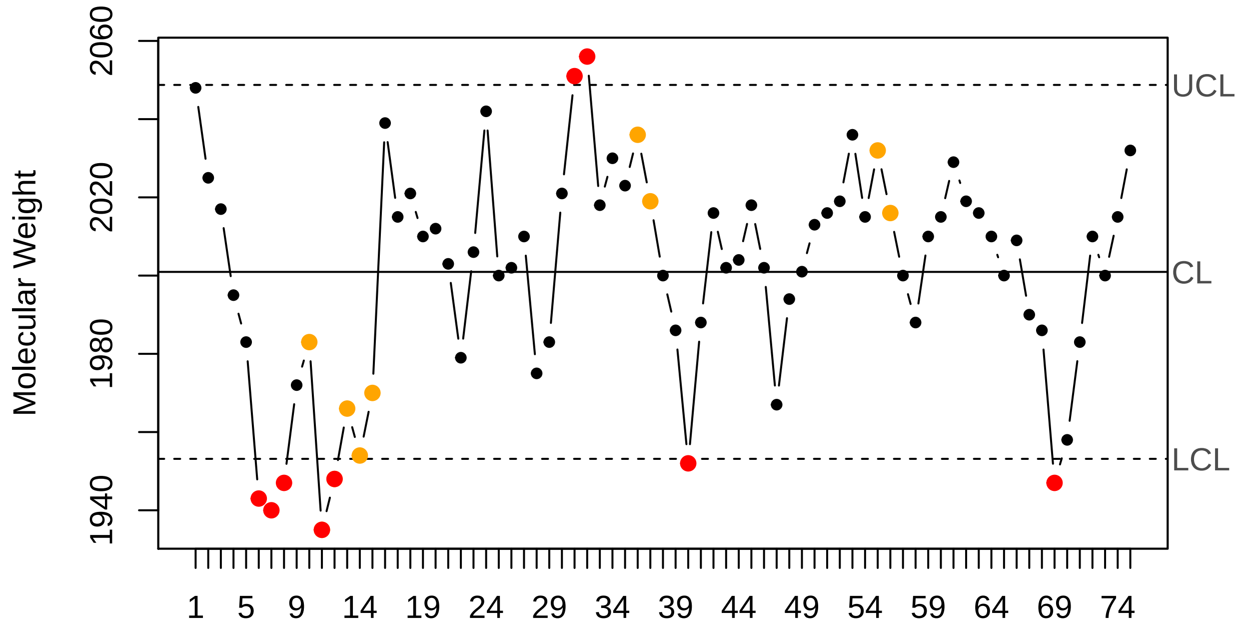


it can be seen that the auto-correlation is 0.6582534 at lag 1. There is some strong positive correlation at lag 1. Here I display auto correlation function for lags 0 to 8.

lag	acf
0	1.0000000
1	0.6582534
2	0.3732448
3	0.2205360
4	0.0725620
5	-0.0395987
6	-0.0121251
7	0.0464498
8	-0.0247948

b)

The control chart is displayed below



where $\hat{\sigma} = 15.9334867$. There appears to be many out of control points on this chart. If this were online and we were taking reactionary measures to OOC points we might be making the process worse by reacting to false fails.

c)

We can fit a model using

$$x_t = \xi + \phi x_{t-1} + \epsilon_t$$

and using `R`'s `ar.ols` function we can estimate ξ and ϕ

$$\hat{x}_t = 661.2524127 + 0.6693528 x_{t-1}$$

Fitting this model and then control charting the residuals ($e_t = x_t - \hat{x}_t$) we can see that only one points is above and/or below the control limits. The process appears much more stable.