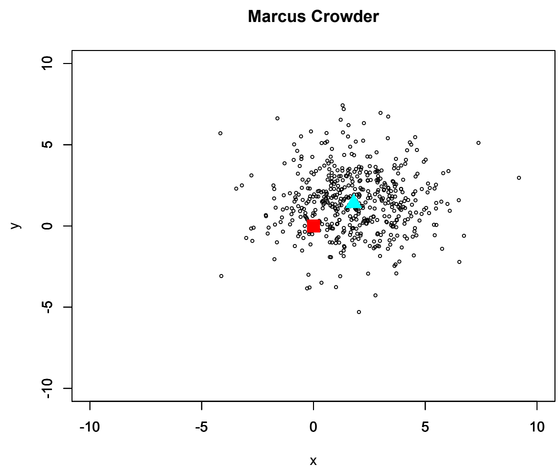
Marcus Crowder
CIS 3920
LN 9



9.1
To Double the deviation of the simulated shots of an archer I used the plot function with the xvariables as 1.8+2*rnorm(500) and y variable as 1.4*2rnorm(500). To add on items to the plot without changing it I used the par(new=TRUE)
I used the plot function again to add the target location at point 0,0 with a red square. For the point she is aiming I used a light blue triangle. Shape changes were done with the pch function while color changes were made by the col function as seen below in my R commands

```
> plot(1.8 + 2*rnorm(500),1.4+2*rnorm(500),xlim=c(-10,10),ylim=c(-10,10), xlab="x", ylab="y", main="Marcus Crowder",cex=0.5)
> par(new=TRUE)
> plot(0,0,pch=15,col=18,xlim=c(-10,10),ylim=c(-10,10),cex=2,xlab=" ",ylab=" ")
> par(new=TRUE)
> plot(1.8,1.4,pch=17,col=5,xlim=c(-10,10),ylim=c(-10,10),cex=2,xlab=" ",ylab=" ")
```

9.2
How will this increased variation in her shots change the number of shots it will take for her to realize her aim is biased? Why will that happen?
As the variation of her shots increase the number of shots she takes to realize this will increase. With Greater Variability of her shots comes a greater chance her shots will fall closer to the original target and can even average the around a specific target. Which less Variability the archer would be able to pinpoint the center(AVG spot) of her variations at a much quicker time. With greater variance comes the increasing likeliness of unpredictability.

9.3
6.3 On page 9, locate and complete this statement: *f*(t) = y(?).
In the lecture notes it was stated that f(t) was meant to forecast the previously observed die roll. So the forecast would be equal to t-1
Which brings me to the conclusion that the forecast of time t would equal

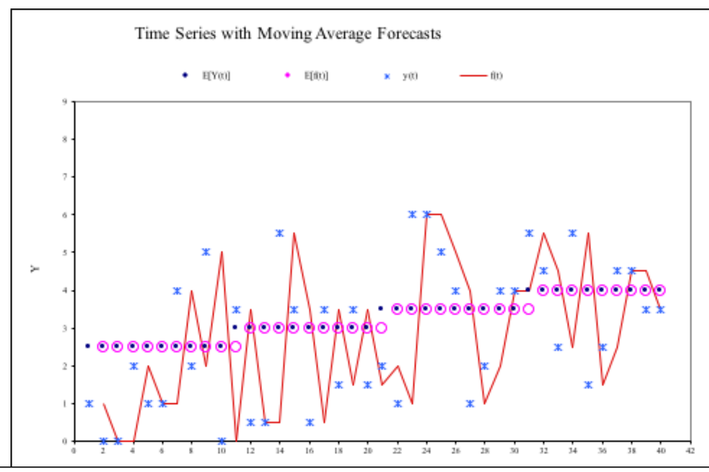
f(t) = y(t-1)

9.4

Likewise, complete this statement: *f*(t) = Y(?). How is that different from 6.3?
In the lecture notes capital Y denotes the outcome of a future roll which can be labeled a forecast so the equation becomes
f(t) =Y(t)
this is different from 6.3 because of the capitalization of the letters from y to Y one accounts for the current value(y) and the other denotes a random variable that hasn't occurred yet. If you were to use f(t) = Y(t-1) you're basically saying "let's use a random variable that has not occurred to forecast another random variable that hasn't occurred" which I don't find quite entertaining to say.

9.5

A tetrahedral die has four sides. For 40 rolls of a fair tetrahedral die, with a change in E(Y) of your choice and at your choice of t, and for w=1, w=10, and for one additional value of w of your choice, create simulation studies as done in the lecture notes. Show at least two simulation plots for each value of w. Based on the plots and the total bias comparison and the MSFE comparisons, what conclusion do you draw?

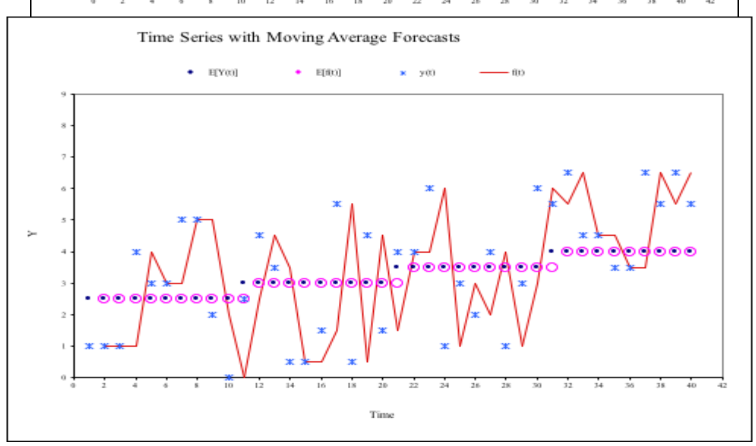


For a w=1 and with a roll of 40 dies I was able to create this plot in excel. I decided to change E(Y) by .5 (with starting E[Y(t)] over 40 steps ending in 4] after 10 additional steps. This plot produced a total Bias and MSFE of

TotalSqBias	MSFE
0.8	5.480769231

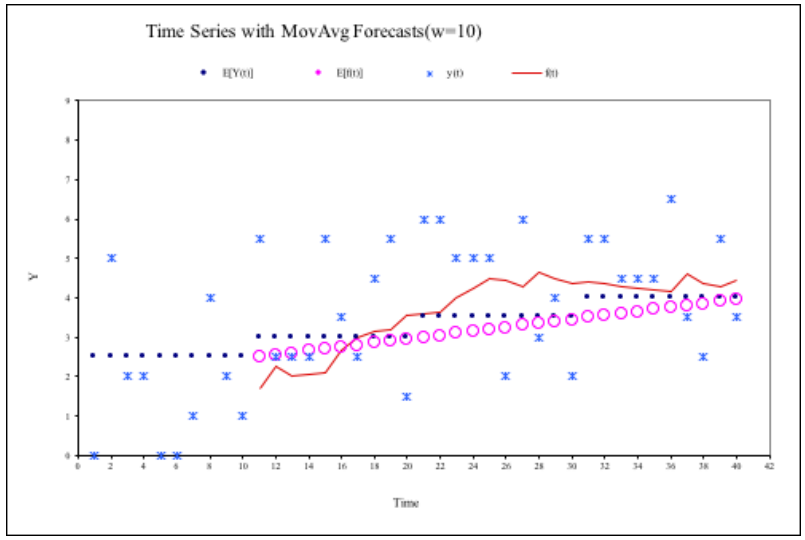
After pressing fn+f9 (Mac Problems) I was able to remake the plot and it ended up with a value of

TotalSqBias	MSFE
0.8	5.096153846



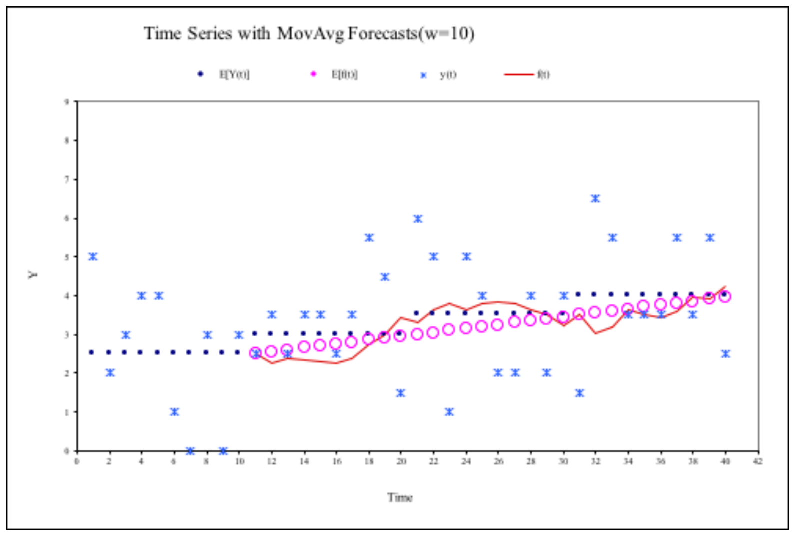
For the window length of 10 with the same 40 time length and change in E(y) I produced this graph

TotalSqBias	MSFE
2.888	2.817



And a second graph with values of

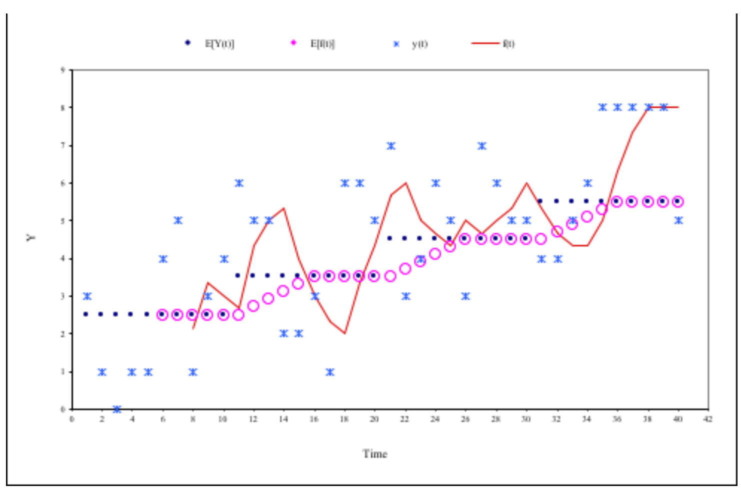
TotalSqBias	MSFE
2.888	2.610



For the Window length of my choosing I decided to use a window length of 5 to be in the middle.

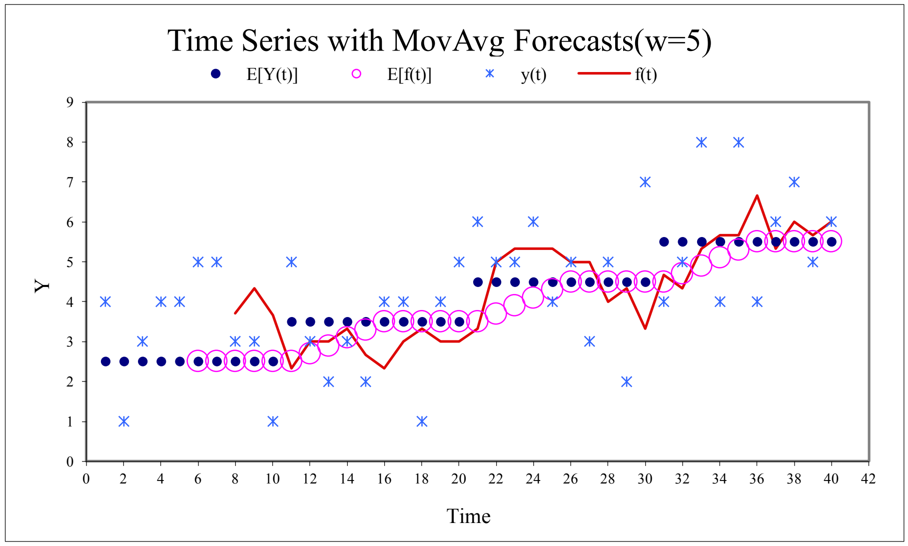
These were the results that were produced for this window length

TotalSqBias	MSFE
6.600	3.231



On my last plot I received

TotalSqBias	MSFE
6.600	2.753



My conclusions draw from all of this is that as I made a bigger window length the MSFE went down but the totalSqBias went up by a lot from being less than 1 for the window length 1 to being 6 for a window length of 5. What was totally suprising was that the window length of 10 had a lower TotalSqBias than the window length of 5 and additionally there were similar MSFE so I believe there is a sweet spot where you can get an adequate amount of tradeoff between Bias and MSFE when going up like I did from 5 to 10. 10 produced better results in my case than 5 but that could also be attributed to me going up by .5 for E(y) (maybe… really unsure)…