

STAT 496
Homework 6 Problems
due Wed. October 31

5 Problems. Show all work.

Please follow the Lab report directions off the homework web page for R Problems. Please work in HW Groups!

Indicate the leader for each problem.

1. Consider the following MA(1) model:

$$Y_t = e_t - 0.6e_{t-1}$$

where $\{e_t\}$ is a mean zero white noise process with constant variance σ_e^2 .

(a) You have already calculated and the ACF for $k = 0, 1, 2, 3, 4, 5$ lags for Homework 3 Problem 2 (a). Now, calculate the PACF ϕ_{kk} by hand for $k = 0, 1, 2$ lags. (You can check your calculations by using the R function `ARMAacf` with the `pacf=TRUE` option.) You do not need to sketch the the PACF. Note: By convention $\phi_{00} = 1$.)

Please see the LaTeX code linked off the HW page so that you can insert your final calculations into your .Rnw document. Below is what the LaTeX should look like and you can fill in the two ?.

MA(1) PACF:

$$\phi_{kk} = \begin{cases} 1 & k = 0 \\ ? & k = 1 \\ ? & k = 2 \end{cases}$$

(b) Use the above model and the R function `arima` to simulate a time series of length $n = 500$. Use the R `set.seed` function, so that you can reproduce your results. Make a time series plot of the data, sample autocorrelation function plot, AND sample PACF. (See the Lab.) You should have one simulated dataset. How does the sample PACF function compare to the one you calculated above in (a)? You do not need to make a table. Just look at the sample PACF and indicate if the estimates are “close” to the theoretical values obtained in (a). (Note: By convention $\phi_{00} = 1$ and is not included on the plot)

2. p. 172: 7.13. (omit (b))

Use the R `set.seed(1)` for the first simulation and the `set.seed(2)` for the second simulation

(a) Use the R function `ar`.

Recall, the method of moments estimate is derived in class is given on p. 149 (7.1.1).

Use the sample ACF function to obtain r_1 from your simulated series. How does this estimate compare to the estimate from `ar`?

(c) Use the R function `arma` with the default method argument `method="CSS-ML"` .

3. Repeat Problem 2: p. 172: 7.13 omit(b), but use a sample size of $n=500$.

4. p. 172: 7.16. (omit (b))

Use the R `set.seed(1)` for the first simulation and the `set.seed(2)` for the second simulation

(a) Use the R function `ar`.

(c) Use the R function `arma` with the default method argument `method="CSS-ML"` .

5. p. 174: 7.26.

(a) Use the R function `ar`.

(b) Use the R function `arma` with the default method argument `method="CSS-ML"`