

Math 484: Lab 2 Homework 5 and the topics below

A) The URL (<http://parker.ad.siu.edu/Olive/rch17.pdf>) has more information on *Arc* and *R* as well as some answers to problems for the old version of the text *Multiple Linear and 1D Regression*. This corresponds to ch. 14 of the current version of the text. Scroll through the file to see what it has.

B) From the “Demos:3D” menu in *Arc*, select “ $E[y|x]$ linear, predictors uncorrelated.” From the “Graph&Fit” menu, select “plot of.” Place x_1 on the H axis, y on the V axis and x_2 on the O axis. Click “ok.” Move the OLS slider bar to “plane.” From the “3Dplot” menu, select “slower” several times. Use the “yaw” button to rotate the plot about the V axis. Extract the OLS fit from the “recall/extract menu.” Select “extract 2D plot.” Next rotate the plot until it seems linear with negative slope. From the “recall/extract menu,” select “extract 2D plot.” Both plots show the linear combination of \mathbf{H} and \mathbf{O} on the bottom. Write down both equations. Q) How are they related (approximately)? Answer) The OLS fit is basically the response plot with $\hat{Y} = \mathbf{x}^T \hat{\boldsymbol{\beta}}$ and the other plot is $\hat{Y} \approx -\mathbf{x}^T \hat{\boldsymbol{\beta}}$ so uses $-\hat{\boldsymbol{\beta}}$.

Repeat but From the “Demos:3D” menu in *Arc*, select “ $E[y|x]$ linear, predictors nonlinear”.

You could also try “ $E[y|x]$ linear, predictors correlated”, “ $E[y|x]$ linear, corr, predictors, x_2 not needed”, and “ $E[y|x]$ linear, uncorr, predictors, x_2 not needed”

C) Get into *R*. The command

```
?lm
```

is the same as `help(lm)`. Scroll down the help file and sometimes there is an example. The command `args(lm)` tells what arguments the `lm` function needs.

Instead of typing `EuStockMarkets`, you can highlight it, hit the `Ctrl` and `c` keys simultaneously, then “Edit>Paste”. Notice that the `plot(full)` command, which gives 4 summary plots, contains a residual plot but not a response plot.

Use the “up arrow” to have the previously typed command reappear. This is useful for simulation if you need to repeat the command several times, or if you made a typo and only need to make a minor change, or if the new command is similar to the previous command. Use “left” and “right” arrows to move the cursor to make a correction or changes, eg for the 4 `EuStockMarkets` commands.

```
data()
?EuStockMarkets
pairs(EuStockMarkets)
help(EuStockMarkets)
zz<-EuStockMarkets
pairs(zz)
FULL <- lm(DAX~SMI+CAC+FTSE,data=zz)
plot(FULL)
help(lm)
args(lm)
?lsfit
args(lsfit)
```

D) In *ARC* enter the menu commands “File>Load>Data” and open the file `mussels.lsp` (sometimes you need to use the commands “File>Load>OSDisc(C:)>Program Files(x86)>Arc>Data>mussels.lsp”). Scroll up to read the description of the data (**always do this in ARC**). Use the commands “Graph&Fit>Scatterplot Matrix of”. In the dialog window select H, L, W, S and M (so select M last). Click on “OK” and include the scatterplot matrix in *Word*. The response M is the edible part of the mussel while the 4 predictors are shell measurements. Are any of the marginal predictor relationships nonlinear? Is $E(M|H)$ linear or nonlinear?

Note that M and W both satisfy the log rule. From the Transformations menu, select *Transform to logs*. Then select *Restore to untransformed*. Then try *Find normalizing transformations*. You can round these to values in the “ladder of powers.” Once you have the transformations you want, select *Add transformed variables to data set* or go to the *mussels menu* and select *Transform*.