

Return to the Prater gasoline data from Exercise 1.12.3 and the model $y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \beta_3 x_{i3} + \beta_4 x_{i4}$ for this quiz. The data are available from TAB9-3.DAT in

http://www.stat.unm.edu/~fletcher/newavdr_data.zip.

Remember, several helpful resources are mentioned in the preface to *R-SL*.

1. Modify the code in *R-SL* Section 4.1 to perform a principal components regression on the Prater data
 - (a) How many principal components would you use? Justify your answer.

 - (b) Regressing y on only the first and second principal components, give the *five* estimated β coefficients.

2. Use the commands discussed in *R-SL* Section 4.3 to find a matrix of scaled predictor variables, say, Z .
 - (a) Give the 4×4 matrix $Z'Z$.

- (b) How does $Z'Z$ relate to the principal component regression?
- (c) Find the eigenvalues of $Z'Z$. (Where in *R-SL* will you find eigenvalue/eigenvector commands?)
- (d) Find a set of corresponding eigenvectors.
- (e) How do the eigenvalues and eigenvectors compare to the principal component analysis?

- (f) Compute Za_1 where a_1 is the eigenvector for the largest eigenvalue. Write down the first five and last five entries in the vector.
- (g) How does Za_1 relate to what in *R-SL* Section 4.1 is called `fit$x`?
3. Perform a default ridge regression on the Prater data. Use the default version of `lm.ridge` in Venable and Ripley's *MASS* package. *Give the estimated regression coefficients.*
4. Perform a default LASSO on the Prater data. Use the default version of `l1ce` in the *lasso2* package. *Give the estimated regression coefficients.*