Fall 2000 Course 513-697: Applied Linear Models

Assignment 1. Hand in at start of class on Monday September 11.

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1 NWNW4 Problems 1.1-1.8, 1.10, 1.12, 1.16, pp 36-40 Exercises 1.29, 1.30, 1.33, 1.34, 1.37.

2 Criteria for choosing the "best" centre ("off the wall" exercise to illustrate that not everything in regression has to be governed by "least squares" and that there are other "best-fit" or "best-guess" criteria). Suppose that every day, you deliver a heavy article to a high-rise building which is served by 3 elevators. None of them has an indicator light to show its current location, and there is but one button for all three. Once you have pushed the button, any one of the 3 elevators may respond -- with equal probability. You must take whichever one arrives next. As shown by the positions of the 3 e's on the diagram below, these elevators are unequally spaced along one wall i.e., at positions 0, 10 and 50. You will need to carry the heavy article to the elevator from wherever along the wall you stand and wait. You can take as long as is required to reach the elevator. Thus, minimizing the distance to the elevator is your only concern.

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a (Without doing any formal calculations, or thinking very long about it) where along the wall would you stand and wait? *[there is no one RIGHT answer]*

b Why would you choose this position? (formal mathematical explanation not required)

c When asked this question, a number of students choose position 10, others 20; a few choose 30. Without doing any calculations, what do you think is being minimized by those who choose these 3 different positions?.

d Do the actual calculations. Do the results change your answers to c? In what way, if any, has this exercise changed your views regarding the properties of various 'centrality' measures?

3 (An exercise to stress that β's have units or "dimensions" and that a β by itself is meaningless unless one knows the units in which Y and X are measured) A British study has reported the distribution of weight and stature (height) of 4,995 women. The slope (β_1) of the linear regression of weight on height was 2.7(?weight unit/?height unit).

a From your own observations and experience, determine whether the weight and height were in Imperial (lbs., inches) or Metric units (1 Kg = 2.2.lbs. ; 1 inch = 2.54 cm.) or even a mix of the two! We think we know which one it isn't, but we wonder about the alternative! [Hint: use your experience; imagine persons 1 unit less in height and how much lighter on average they would be]. For real North American data, go to two datasets (Berkeley and bodyfat) in http://www.epi.mcgill.ca/~web2/hanley/c678/ . [you can use your 'eye' or do a formal fit, as you wish].

b Why is it inappropriate to make guesses for μ_Y and μ_X, join these using a straight line to the point (0,0), and then estimate the slope as μ_Y / μ_X ?