553.633/433

Homework #2

Due Wed. 9/12/18

There are four problems (A, B, C, and one from the textbook):

A. Consider a game of chance where a bettor specifies a dollar amount $\theta \geq 0$. Then, two fair dice are rolled, yielding a sum $V \in \{2, 3, \ldots, 12\}$. The stake that the bettor will win or lose is equal to $2^V\theta$ (further rules or characteristics of the game, such as whether the game is fair or not, are not relevant here). The bettor would like to choose an amount θ that maximizes the expected stake, but the bettor is risk averse in the amount θ^2 to reflect the fact that the bettor may lose the stake. Do the following:

(a) Suppose the bettor is to determine the amount θ based on maximizing the difference of the expected stake and the risk aversion. Give the function for the bettor to maximize with respect to θ and then solve for the optimal amount.

(b) Suppose the bettor has a poor understanding of probability and attempts to determine the optimal amount while committing the "flaw of averages." What amount θ will the bettor then use to play the game? Comment on why the solution here differs from that found in part (a).

B. Exercise 4 in week 1 handout (file MonteCarlo_intro_handout.pdf, corresponding to slides shown in class).

C. Give examples of two matrices $\boldsymbol{A}$ and $\boldsymbol{B}$ such that:
(a) $\text{rank}(\boldsymbol{AB}) < \min\{\text{rank}(\boldsymbol{A}), \text{rank}(\boldsymbol{B})\}$.
(b) $\text{rank}(\boldsymbol{AB}) = \min\{\text{rank}(\boldsymbol{A}), \text{rank}(\boldsymbol{B})\}$.

Exercise from the textbook: 1.11, part (a) only