Homework 3

Statistics and Probability review (15 points)

Due Date: Monday Feb 15 at 11:59 pm

Instruction:

- This HW must be done in Rmarkdown!

- Please submit both the .rmd and the Microsoft word files. (Do not submit a PDF or any other image files as the TAs are going to give you feedback in your word document)

- Name your files as: HW3-groupnumber-name

- All the HW assignments are individual work. However, I highly encourage you to discuss it with your group members.

- Late homework assignments will not be accepted under any circumstances.

Appendix A

Note: Appendix A is basic mathematical tools. We didn't talked about it in the class but I am confident that you already know the material. If not, first read the Appendix-A from Wooldridge textbook and then answer the following questions.

Question 1 The following table contains monthly housing expenditures for 10 families.

Family	Monthly Housing Expenditures (Dollars)
1	300
2	440
3	350
4	1,100
5	640
6	480
7	450
8	700
9	670
10	530

   (i) Find the average monthly housing expenditure.
  (ii) Find the median monthly housing expenditure.
 (iii) If monthly housing expenditures were measured in hundreds of dollars, rather than in dollars, what would be the average and median expenditures?
 (iv) Suppose that family number 8 increases its monthly housing expenditure to $900, but the expenditures of all other families remain the same. Compute the average and median housing expenditures.

Question 2 Suppose that the return from holding a particular firm's stock goes from 15% in one year to 18% in the following year. The majority shareholder claims that "the stock return only increased by 3%," while the chief executive officer claims that "the return on the firm's stock increased by 20%." Reconcile theird disagreement.

Question 3 Suppose the following model describes the relationship between annual salary (salary) and the number of previous years of labor market experience (exper):

$$log(salary) = 10.6 + 0.027exper$$

(i) What is salary when $exper = 0$? When $exper = 5$? (Hint: You will need to exponentiate.)

(ii) Use this equation: $\%\Delta y \approx (100 * \beta_1)\Delta x$ to approximate the percentage increase in salary when exper increases by five years.

(iii) Use the results of part (i) to compute the exact percentage difference in salary when $exper = 0$ and When $exper = 5$. Comment on how this compares with the approximation in part (ii).

Appendix B

Question 4 Let X be a random variable distributed as $X \sim Norm(5, 4)$. Find the probabilities of the following events. Hint: $E(X) = 5$ and $Var(X) = 4$

(i) $P(X \leq 6)$

(ii) $P(X > 4)$

(iii) $P(|X - 5| > 1)$

Question 5 For a randomly selected county in the United States, let X represent the proportion of adults over age 65 who are employed, or the elderly employment rate. Then, X is restricted to a value between zero and one. Suppose that the cumulative distribution function for X is given by

$$F(x) = 3x^2 - 2x^3, 0 \leq x \leq 1$$

Find the probability that the elderly employment rate is at least 0.6 (i.e. 60%).

Question 6 Let X denote the annual salary of university professors in the United States, measured in thousands of dollars. Suppose that the average salary is 52.3, with a standard deviation of 14.6. Find the mean and standard deviation when salary is measured in dollars.