

**Department of Industrial Engineering & Operations Research**

**IEOR 165 (Spring 2016)**

Practice Questions

**Question 1.** The weekly counts of earthquakes in North America for 8 consecutive weeks (suppose they are iid) are summarized in the following table:

Week	1	2	3	4	5	6	7	8
Counts	7	6	10	9	15	12	14	11

Assuming that the earthquake count follows Poisson distribution with rate  $\lambda$ . Estimate  $\lambda$  using the method of moments.

**Question 2.** Suppose you are given the following data set that includes the annual sales in different markets of different size. Construct a linear model to predict the sales in a new market with known size. Please specify the response and the predictor and estimate the corresponding parameters.

Market size (thousand)	20	35	53	59	72
Sales (thousand)	5	7	9	10	11

**Question 3.** In the context of Question 2, if we assume  $Var(S|M) \propto M$  ( $S$ : Sales,  $M$ : Market size), re-estimate the parameters of the linear model you derived in Question 2.

**Question 4.** Let  $X_1, \dots, X_n$  be iid with one of two pdfs. If  $\theta = 0$  then

$$f(x|\theta) = \begin{cases} 1 & \text{if } 0 < x < 1 \\ 0 & \text{o.w.} \end{cases}$$

while if  $\theta = 1$

$$f(x|\theta) = \begin{cases} \frac{1}{2\sqrt{x}} & \text{if } 0 < x < 1 \\ 0 & \text{o.w.} \end{cases}$$

Find the MLE of  $\theta$ .

**Question 5.** In the context of Question 1, suppose we do not make any assumption about the distribution of earthquake count, please estimate the density of earthquake count at the point  $u = 8$  by choosing one method you learned in the class. Specify your method and corresponding details.