# Stat 8003, HW7

Due: Thursday, Nov 13th, 2014

**1.** Let $X_1, \cdots, X_n$ be a random sample from an exponential distribution with the density function

$$f(x|\theta) = \theta \exp(-\theta x).$$

The observed data are the following:

```
1.07   0.88   0.66   0.55   1.15   0.65   3.45   3.55   3.51   0.48
```

(a) Find an exact pivot;

(b) Use the pivot to construct the 95% confidence interval for $\theta$;

(c) Apply your interval to this data set.

**2.** Consider an i.i.d. sample of random variables with density function

$$f(x|\sigma) = \frac{1}{2\sigma} \exp(-\frac{|x|}{\sigma}).$$

Use the approximate pivot method to construct a $100(1-\alpha)\%$ confidence interval of $\sigma$.

**3.** A sample of students from an introductory psychology class were polled regarding the number of hours they spent studying for the last exam. All students anonymously submitted the number of hours on a 3 by 5 card. There were 24 individuals in the one section of the course polled. The data was used to make inferences regarding the other students taking the course. There data are below:

```
4.5 7.5  22  9  7  10.5  14.5  15  9
19  9  3.5   8   11   2.5   5   9   8.5
7.5   18   20   14   20  8
```

(a) Obtain a confidence interval based on central limit theorem;

(b) Obtain a confidence interval based on T-distributions;

(c) Obtain a confidence interval based on bootstrapping with B=10,000.

**4.** The Poisson distribution has been used by traffic engineers as a model for light traffic, based on the rationale that if the rate is approximately constant and the traffic is light (so the individual cars move independently of each other), the distribution of counts of cars in a given time interval or space area should be nearly Poisson. The following table shows the number of right turns during 300 3-min intervals at a specific intersection.

| n | Frequency |
|---|---|
| 0 | 14 |
| 1 | 30 |
| 2 | 36 |
| 3 | 68 |
| 4 | 43 |
| 5 | 43 |
| 6 | 30 |
| 7 | 14 |
| 8 | 10 |
| 9 | 6 |
| 10 | 4 |
| 11 | 1 |
| 12 | 1 |
| 13+ | 0 |

(a). Use the pivot method to construct a $(1-\alpha)$ confidence interval of the rate;

(b). Use variance stabilization method to construct a $1-\alpha$ confidence interval of the rate;

(c). Plug in the data and calculate the 95% CI by both methods. Which one do you prefer?