Research Methods in Political Science I, Homework Assignment 10

Due: 9pm on 16 December 2015

How to submit: Send as an email attachment

Email subject: Research Methods 1, Assignment 10

File names: `hw10-YourName.pdf`

Q1. You have a coin with the probability of heads θ. You flipped it 10 times and got 3 heads. Answer the following questions.

1. Visualize the likelihood function of θ given the data.
2. Visualize the log-likelihood function of θ given the data.
3. Obtain the maximum likelihood estimate (MLE) of θ.
4. Calculate the observed Fisher information of θ.

Q2. Suppose x is identically and independently distributed normal variable with the mean θ and the *known* variance σ^2. You observed 10 realizations of x: $x = \{9, 9, 10, 16, 8, 14, 7, 11, 12, 19\}$. Answer the following questions.

1. Visualize the log-likelihood function of θ given the data.
2. Obtain the MLE of θ.
3. Calculate the observed Fisher information of θ.
4. Calculate the standard error of the MLE.

Q3. Suppose x is identically and independently distributed normal variable with the mean θ and the *known* variance σ^2. Ten values of x were observed, but all you know is the sample mean: $\bar{x} = 11.5$. Answer the following questions.

1. Visualize the log-likelihood function of θ given the data.
2. Obtain the MLE of θ.
3. Calculate the observed Fisher information of θ.
4. Calculate the standard error of the MLE.

Q4. Compare Q2 and Q3 above. What are the differences between them? What conclusions do you reach?