Research Methods in Political Science I – Homework Assignment 3

Due: 9am on 28 October 2015

How to submit: Send as email attachments

Email subject: Research Methods 1, Assignment 3

File names : `hw03-YourLastName.Rmd` and `hw03-YourLastName.html`

Note: *You have to attach 2 separate files to the email.* If you use the university's email system, you might have to zip (compress) the files.

Assignment

Answer the following questions in an R Markdown file, and submit the original R markdown and its output html files. Keep in mind that your work should be *reproducible*.

Note: I will upload your html files on the course website. Please do not write the sensitive information (e.g., your birthday, phone number) in the files you submit.

1. Create an R function to calculate factorials. You are not allowed to use the built-in function `factorial()`. The factorial of a non-negative integer n is denoted $n!$, and

$$n! = n(n-1)(n-2)\cdots 1,$$

   where $0! = 1$.

2. Using your own factorial function, create an R function to calculate the number of possible combinations that can be obtained by taking a subset of elements from a larger set. You are not allowed to use the built-in function `choose()`. There are $\binom{n}{k}$ possible ways to choose k elements from n, and

$$\binom{n}{k} = \frac{n!}{k!(n-k)!}.$$

3. Using your own combination function, create an R function to calculate the probability mass of binomial distributions. You are not allowed to use the built-in function `dbinom()`. The PMF of the binomial distribution $f(x)$ can be written as

$$f(x) = \binom{n}{x} p^x (1-p)^{n-x} \qquad (x = 0, 1, 2, \ldots, n),$$

where n is the number of independent Bernoulli trials, and p is the probability of success for each trial.

4. Using your own binomial PMF, display graphically the PMF of binomial distributions for $n = 2, 5, 10$, and 50. You can choose p as you like, but you have to use at least two different values for p.

Tips: Before creating a function, ponder what should be the arguments and how many arguments it should have. In addition, don't forget to specify the return value(s). Add helpful comments to your codes.