

Homework 13



Directions

Using R Markdown in R Studio, complete the following questions. Launch RStudio and open a new RMarkdown file or use the class RMarkdown template provided and save it on your working directory as a .Rmd file. At the end of the activity, save your pdf generated from RMarkdown+Knitr and submit your homework on the Blackboard.

If you have questions, please post them on the lesson's Discussion Board.

All questions are mandatory. R code and output must be clearly shown.

Homework submitted after the due date will attract a penalty of 10 points per day after the due date.

1. Write an R function for computing the value of

$$f(x) = e^{-x^2}$$

and test it for a vector $x = c(0, 1, 100)$.

2. Write an R function to compute the sample excess kurtosis given by

$$g_2 = \frac{\frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^4}{\left(\frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2\right)^2} - 3$$

for a given vector $x = (x_1, \dots, x_n)$, where \bar{x} is the average of the elements of x . Test the function for a vector $x = 1:10$.

3. Suppose Jane wishes to take out a mortgage on a house. She wants to know what her periodic payments will be. If P is the initial amount mortgaged, r is the effective interest rate, and n is the length of the mortgage, then the periodic payment R is given by

$$R = \frac{Pr}{1 - (1 + r)^{-n}}$$

- (a) Construct a function which employs this formula
 - (b) Calculate Jane's monthly payments, if the initial amount is \$100,000, the interest rate is 1% and the number of interest conversions periods is 300.
4. Suppose payments of P dollars are deposited annually into a bank account which earns constant interest r per year. What is the accumulated value of the account at the end

of n years, supposing deposits are made at the end of each year? The total amount at the end of n years is given by the expression

$$Amount = P(1+r)^{n-1} + \cdots + P(1+r) + P = P \frac{(1+r)^n - 1}{r}$$

- (a) Write an *R* function to compute the accumulated amounts after $n = 10$ years, with periodic payments $P = \$400$ with a vector of interest rates r ranging from 0.01 to 0.2 by increments of 0.01.
- (b) Produce a line plot of the amounts (y-axis) against the interest rates (x-axis)
- (c) **Optional question:** Write a single function to perform both parts (a) and (b) above.