



Statistical Computing and Simulation HW3

授課教授：余清祥教授

學生： 統計碩一 106354003 林健宏

統計碩一 106354012 曹立諭

目錄

# Question 01.....	2
# Question 02.....	3
# Question 03.....	4
# Question 04.....	5
# Question 05.....	6
附錄 (R code).....	7
1.....	7
2.....	8
3.....	9
4.....	10
5.....	11

Question 01.

Experiment with as many variance reduction techniques as you can think of to apply the problem of evaluating $P(X > 1)$ for $X \sim \text{Cauchy}$.

Question 02.

Hammersley and Handscomb (1964) used the integration of $\theta = \int_0^1 \frac{e^x - 1}{e - 1} dx$ on $(0,1)$

as a test problem of variance reduction techniques (which is about 0.4180233).

Achieve as large a variance reduction as you can. (They achieved 4 million.)

Question 03.

Let $X_i, i = 1, 2, 3, 4, 5$ be independent exponential random variables each with mean 1, and consider the quantity θ defined by $\theta = P(\sum_{i=1}^5 X_i \geq 21.6)$.

Propose at least three simulation methods to estimate θ and compare their variances.

Question 04.

First, simulate 100 observations from $\text{Beta}(2,3)$ and then use 3 density estimating methods to smooth the observations. You need to specify the parameters in the smoothing methods, and compare the results.

Question 05.

Let x be 100 equally spaced points on $[0, 2\pi]$ and let $y_i = \sin x_i + \epsilon_i$ with $\epsilon_i \sim N(0, 0.09)$.

Apply at least 3 linear smoothers and compare the differences, with respect to mean squares error (i.e., bias^2 and variance) from 1,000 simulation runs.

□ 附錄 (R code)

Github : <https://github.com/CaoCharles/Statistical-Computing-and-Simulation-HW3>

R Markdown :

- 1.

2.

3.

4.

5.