Homework IV (Group)

Due date: 23:59 on January 06 (Wednesday), 2021

This is an optional homework (可以選擇不繳交). If you wish to give it a try, please store the answers in a pdf file and upload the **pdf together with *R* file** onto WM5. Each group submits only ONE copy. Make sure your names and IDs can be found on the pdf. Please show the simulation model on the document too. NO late submission will be accepted.

A Price-Setting Newsvendor Problem (Zhan & Shen 2005)

p = retail price.
Q = order quantity.
v, s, c = per unit salvage value, shortage cost, and purchase cost, respectively.
$D(p, \epsilon) = a - bp + \epsilon$. ϵ = stochastic term

In this paper, the stochastic price-sensitive demand D is modeled in an additive demand form, i.e., $D(p, \epsilon) = a - bp + \epsilon (a > 0, b > 0)$. ϵ is a random variable defined on [A, B] with mean μ, cumulative distribution function (cdf) $F(\cdot)$ and probability density function (pdf) $f(\cdot)$. Before the stochastic term ϵ is realized, the newsvendor determines simultaneously an order quantity, Q, and a retail price, p, to maximize the expected profit. We also assume that $v < c$ to avoid the trivial solution.

Denote $x^+ = \max\{x, 0\}$, the newsvendor's profit can be expressed as the difference between the revenue and the total cost:

$$\pi(Q, p) = p\min\{Q, D(p, \epsilon)\} - cQ + v(Q - D(p, \epsilon))^+ - s(D(p, \epsilon) - Q)^+. \quad (1)$$

$$v = 0.5, s = c = 1, a = 200, b = 35$$

Assume ε follows a normal distribution with mean 0 and standard deviation 20, write a simulation program, which simulates S=5000 demand points and returns the expected profit given your decisions on Q and p. Here Q and p are **continuous real numbers (正實數)**.

(a) Use the Hooke-Jeeves algorithm to find the best Q, p, and expected profit

(b) Use the genetic algorithm to find the best Q, p, and expected profit

(c) Which algorithm gives you the optimal decisions?

(d) Repeat (a) - (c) by assuming ε follows an exponential distribution with mean 10.

P.S.: Please search Q in [10, 200] and p in [1, 5.5].