Question 9 traditionnel chapitre 1

2022-09-26

Panjer

Contexte

```
library(actuar)
v <- 0.95
parPa <- c(3, 4000)
parBN <- c(2, 1)
```

b)

Pour discrétiser Y_1 on trouve $F_{Y_1}(x)$,

$$F_{Y_1}(x) = \Pr(Y_1 \leq x) = \Pr(vB \leq x) = \Pr\left(B \leq \frac{x}{v}\right) = F_B\left(\frac{x}{v}\right).$$

De cette façon on peut discrétiser B pour trouver $f_{\tilde{C}}(1000k)$. On fait la même chose pour $f_{\tilde{D}}(1000k)$.

```
fc <- discretize(ppareto(x/v, parPa[1], parPa[2]), 0, 1000022, 1000, method = "lower")
fd <- discretize(ppareto(x/v^2, parPa[1], parPa[2]), 0, 1000000, 1000, method = "lower")
#sum(fc)
#sum(fd)

panjer.nbinom2 <- function(rr, beta, ff, smax){
aa <- beta/(1 + beta)
bb <- aa*(rr - 1)
ll <- length(ff)
qq <- 1/(1 + beta)
ffs <- (qq/(1 - (1 - qq)*ff[1]))^rr
ff<-c(ff, rep(0, smax - ll + 1))
  for (i in 1 :smax){
    j <- i + 1
    ffs <- c(ffs, (1/(1 - aa*ff[1]))*sum(ff[2 :j]*ffs[i :1]*(bb*(1 :i)/i+aa)))
}
return(ffs)
}

fy1 <- panjer.nbinom2(2, 1, fc, length(fc))
fy2 <- panjer.nbinom2(2, 1, fd, length(fd))

DirectConvo <- function(f1, f2, smax = 1000){
  f1 <- c(f1, numeric(smax - length(f1) + 1))
  f2 <- c(f2, numeric(smax - length(f2) + 1))
  fs <- f1[1] * f2[1]
  for(i in 1:smax){
    j <- i + 1
```

```
    fs <- c(fs, sum(f1[1:j] * f2[j:1]))
  }
  fs
}

fz <- DirectConvo(fy1, fy2, smax = 1002)

fz[c(1, 11, 21)]
```

```
## [1] 0.06250000 0.04269752 0.01351135
```

c)

```
Fz <- cumsum(fz)
Z <- seq(0, 1e6, 1000)

VaR <- Z[min(which(Fz >= 0.99))]
VaR
```

```
## [1] 42000
```

FFT

Contexte

```
library(actuar)
nFFT <- 2^10
v <- 0.95
parPa <- c(3, 4000)
parBN <- c(2, 1)
```

b)

```
fc <- c(discretize(ppareto(x/v, parPa[1], parPa[2]), 0, 1e6, 1e3, "lower"),
        numeric(nFFT - length(seq(0, 1e6, 1e3))))
fd <- c(discretize(ppareto(x/v^2, parPa[1], parPa[2]), 0, 1e6, 1e3, "lower"),
        numeric(nFFT - length(seq(0, 1e6, 1e3))))

fzt <- (1 - parBN[2] * (fft(fc) - 1))^-parBN[1] * (1 - parBN[2] * (fft(fd) - 1))^-parBN[1]
fz <- Re(fft(fzt, T))/nFFT

fz[c(1, 11, 21)]
```

```
## [1] 0.06250000 0.04269752 0.01351135
```