Collective risk

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Simulation in Prob and Stats BSc AMC at UC3M

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Contents

Introduction

- Goal:
    - Compute the probability that the capital of an insurance company remains positive during a given time period
- Data:
    - Premium: a
    - Claims rate: $Poisson(\lambda)$
    - Premium amount: $Pareto(2.5, 100)$
    - Enrollment rate: $Poisson(\nu)$
    - Departure rate: $Exp(\mu)$
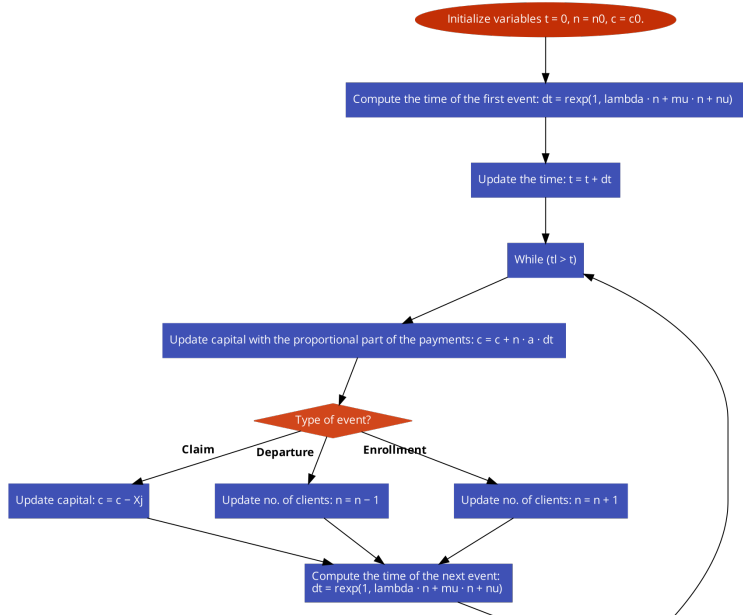   - Initial capital: c_0

Introduction

So in general, the capital of the company at any time t will be:

$$C(t) = c_0 + at(n_0 + N_A(t) - N_D(t)) - \sum_{j=1}^{N_C(t)} X_j$$

where:

- $N_A(t)$ is the number of clients that arrive by time t
- $N_D(t)$ is the number of clients that leave by time t
- $N_C(t)$ is the number of claims that arrive by time t
- X_j is the amount of the j-th claim
- $n(t)$ is the number of clients at time t.

The project

Initialize variables t = 0, n = n0, c = c0.

Compute the time of the first event: dt = rexp(1, lambda · n + mu · n + nu)

Update the time: t = t + dt

While (tl > t)

Update capital with the proportional part of the payments: c = c + n · a · dt

Type of event?

Claim

Departure

Enrollment

Update capital: c = c − Xj

Update no. of clients: n = n − 1

Update no. of clients: n = n + 1

Compute the time of the next event:
dt = rexp(1, lambda · n + mu · n + nu)

Results

Numerical results, quality assessment of the approximations, and time efficiency of the algorithms. Use tables and/or charts.

Conclusions

About the results, how the difficulties were solved, and possible alternative approaches. Keep the focus, the conclusions must be as brief as possible.

References

Including textbooks, webpages, and class notes.