

Earthquake Risk Assessment

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Outline

- Poisson Processes
- Gutenberg-Richter equation
- Risk Assessment

X(t) is a Poisson process with parameter λt

$$P\{X(t) = k\} = e^{-\lambda t} \frac{(\lambda t)^k}{k!}$$

$$E\{X(t)\} = \lambda t$$

$$E\{X^2(t)\} = \lambda^2 t^2 + \lambda t$$

For a region, the probability that n earthquakes with magnitude equal to or greater that M occur in a time duration of t is given as

$$P\{X_M(t) = n\} = P_M(n, t) = e^{-Nt} \frac{(Nt)^n}{n!}$$

Here N is the mean number of earthquake with magnitude M occurring in one year.

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Gutenberg-Richter Equation

$$\log_{10} N = a - bM$$

M = Earthquake magnitude on Richter Scale
a and b = Seismic coefficient estimated based on historical data

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Probability of zero occurrence

$$P_M(0, t) = e^{-Nt}$$

Seismic Risk

$$R_M(t) = 1 - P_M(0, t) = 1 - e^{-Nt}$$

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Thank you!

Questions?

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