Statistical Methods for Counting Processes

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General Information I

- weekly hours: 2 (lecture) + 1 (tutorial)

  ↪ tutorial takes place every two weeks

- language: English

- modules:

  ↪ Statistics: MS 6, MS 7 (special fields)

  ↪ Data Science: MD E1 (elective course)

  ↪ Econometrics: ME 7 (econometric methods)

- requirements: none

  ↪ basic knowledge of probability theory is recommended (e.g., module MS 1/MD 2)

  ↪ prior experience with stochastic processes is helpful

General Information II

- lecture notes and/or beamer slides will be made available

- examination: bi-weekly exercises and final project

  - $\hookrightarrow$ exercises and project contribute equally to the final grade

  - $\hookrightarrow$ individual submissions are required

  - $\hookrightarrow$ exercises and final project must be solved with R

- further information on lecture times and formalities in Moodle

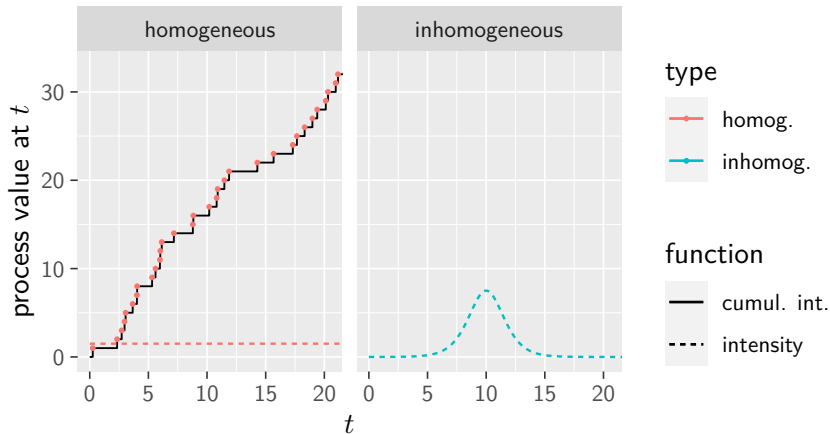# Why You Should Be Interested in Counting Processes

Figure: A few fields of application for counting processes.
Sources: (1) M. Jakubzik, (2) Müller, Szugat and Maurer 2016, (3) A. Tarazevich, (4) E. Jenner (stock photos, https://www.pexels.com/)
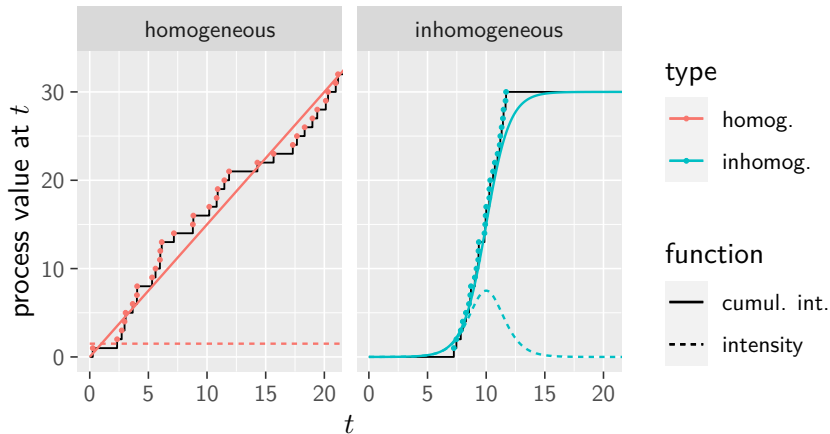
Counting Processes and Their (Cumulative) Intensities

Figure: Illustration of the (in-)homogeneous Poisson process and its (cumulative) intensity process.

Counting Processes and Their (Cumulative) Intensities
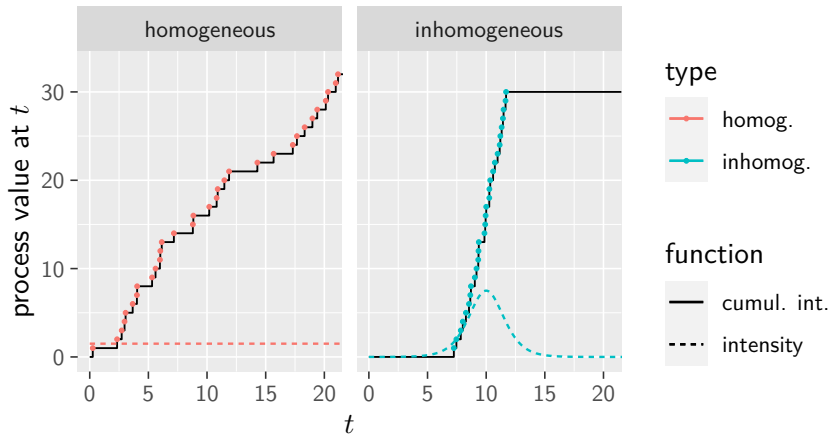
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Lecture Overview

Counting processes play an important role in event history analysis.

In the course "Statistical Methods for Counting Processes", we

- get to know stochastic intensities and their properties,

- establish a relationship between intensity and event rate,

- learn about popular intensity-based models,

- simulate counting processes with given intensities,

- study both parametric and non-parametric estimators,

- conduct goodness-of-fit tests in parametric models,

… and apply all of this to practical examples with the help of R.