

## *Duration models*

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Course : 3 hours - TP : 9 hours

### *Objectives*

This course is designed to provide a fairly exhaustive survey of the theory and practice of the principal duration models. The analysis of survival data is now widespread in a variety of domains in which statistics are applied (biometrics, econometrics, insurance, demography, finance). Analysis methods have seen rapid development in the last twenty years. The aim is to provide an overview of the standard estimators and models together with the means of apprehending a more modern formalization. The chapters will be illustrated with examples drawn from the international literature.

### *Outline*

- **Introduction to duration models:** problems, specificities and tools (survival, hazard). Censoring and truncation. Heterogeneity problems.
- **The Kaplan-Meier estimator:** Definition and interpretation. Convergence properties.
- **Parametric models:** Proportional or additive hazard models. The case of grouped data, additive models, unobserved heterogeneity.
- **The Cox model:** Partial likelihood. Estimating basic survival and hazard.
- **Multivariate and concurrent risk models.**

### *Bibliography*

- Delwarde, A., Denuit, M. (2006) *Construction de tables de mortalité périodiques et prospectives*, Paris, Ed. Economica.
- Kalbfleisch, J.D., Prentice, R.L. (2002) *The statistical analysis of failure time data, Second Ed.* New-York, Wiley.
- Planchet, F., Thérond, P. (2011) *Modélisation statistique des phénomènes de durée, applications actuarielles*, Paris, Ed. Economica.