



Washington University in St. Louis

SP2017 L32 Pol Sci 555 01: Longitudinal and Event History Models for the Social and Political Sciences

- **Time:** Monday, 2-4PM
- **Location:** Cupples II 200.
- **Description:** This 3-credit course will cover the statistical concepts and techniques that are used to model social and political events over time, including basic time-series and event history (survival) data. Such data routinely occurs in both the social sciences and public health sciences. Lectures will introduce: second order stationary time series, autoregressive structures, spectrum and linear filtering theory, autocorrelation consistent (HAC) variance estimation, survival functions, hazard rates, types of censoring and truncation. Modes of inference for regression models will be provided. All applied work will be in the R software environment for statistical computing and graphics. Students will be able to identify and classify data problems in longitudinal analysis, define the appropriate function accounting for time as well as summarize and interpret analyses of such data using various estimators. In addition, participants will be able to formulate research questions related to longitudinal data and the appropriate associated regression models or other approach.
- **Course Objectives:** Students will be able to identify and classify data problems in survival analysis, define the appropriate survival function, distribution function, hazard function, relative hazard, and cumulative hazard, as well as summarize and interpret analyses of survival data using various estimators. In addition, participants will be able to formulate research questions related to survival data and the appropriate associated regression models or other approach. We will also cover time series models as space permits.
- **Prerequisite Details:** This course assumes a knowledge of basic statistics as taught in a first year undergraduate or graduate sequence. Topics should include: probability, cross-tabulation, basic statistical summaries, and linear regression in either scalar or matrix form. Knowledge of R, basic matrix algebra and elementary calculus is required. All analysis in this course will be done with R, so students should come prepared in this regard.
- **Course Grade:** 40% will be 8 problem sets, 5% will be for the summarization paper, 45% will be for the research paper, and 10% is for weekly attendance and participation. For the summarization paper you will lead a 20 minute discussion of a paper using the methods in this course in your field of interest. This should resemble the standard “journal club” format. The research paper is due March 27 to me and the entire class. This paper will apply a survival model to data in your area of study. The end product will be an empirical paper ready for submission to a major journal. Presentations of the research papers will take place at the end of course. The format of these presentations will be exactly that of a faculty job talk: 40 minutes to summarize the research and 20 minutes for questions. Every participant must ask a question during this time.
- **Office Hours:** By appointment.
- **Incompletes:** Due to the scheduled nature of the course, no incompletes will be given.
- **Teaching Assistant:** Jonathan Homola (homola@wustl.edu). Office hours: TBD in Seigle 277.

- **Required Reading:**

1. Göran Broström. Event History Analysis with R. Chapman & Hall/CRC 2012, ISBN: 978-1-4398-3164-9.
2. Jan Box-Steffensmeier and Brad Jones. Event History Modeling. Cambridge University Press 2004, ISBN: 0521546737.
3. Data, slides, assignments, and other resources are available at Brad Jones' [webpage](#) for the book.

- **Slides:** Slides provided herein on the syllabus.

- **Topics (subject to minor change):**

- **January 23.** Overview of Survival Models, slides. Assignment:

1. Replicate the government duration model and graphs.
2. Replicate one of the colon cancer graphs.

- **January 30.** Broström Chapter 1: Event History and Survival Data, Box-Steffensmeier and Jones Chapter 1: Event History in the Social Sciences. Assignment:

1. Run the lexis diagram code with five different cases. You will have to reparameterize `start=1864`, `stop=1867`, `min.age=87` to make the result look clear in the plot. Turn in a screenshot or pdf of the result.
2. Using the `infants` dataset fit a Cox Proportional Hazards model. For example: `inf.fit <- coxph(Surv(enter, exit, event) ~ civst, data = infants)`. Submit the output from `summary`.
3. Submit a one-paragraph general description of your dataset describing each of the variables you intend to use like page 3 of the Broström book.

- **February 6.** Broström Chapter 2: Single Sample Data, Box-Steffensmeier and Jones Chapters 2-3: The Logic of Event History Analysis, Single-Spell Models. Assignment:

1. Reproduce Figure 3.1 in Box-Steffensmeier and Jones. Note that this requires rerunning the models.
2. Run a Kaplan-Meier analysis with your data.
3. Submit the data for your empirical paper.

Chapter 3: Parametric Models for Single-Spell Duration Data.

- **February 13.** Broström Chapter 3: Cox Regression, Box-Steffensmeier and Jones Chapter 4: The Cox Proportional Hazards Model. Assignment:

1. Problem Set 1 from Brad Jones' webpage for the book.
2. Rerun the the U.N. peacekeeping missions analysis from the chapter in R. Brad Jones has `Stata` code and data to get started.

- **February 20.** Broström Chapter 4: Poisson Regression, Box-Steffensmeier and Jones Chapter 5: Models for Discrete Data. Assignment:

1. Do a log rank test with your data.
2. Test for an interaction with a likelihood ratio test.
3. Run a Cox PH regression model for the `oldmort` data:
 - (a) Pick a mix of explanatory variables that leads to a well-fitting model.
 - (b) Test it with a LRT for each submodel.

- (c) Specify an interaction effect that makes sense.
- **February 27.** Broström Chapter 5: More On Cox Regression, Box-Steffensmeier and Jones Chapter 7: Inclusion of Time-Varying Covariates. Assignment:
 1. Problem Set 2 from Brad Jones' webpage for the book.
 2. Using your own dataset run a Cox proportional hazards model and report the results describing the variables and the model. Perform the appropriate diagnostics.
- **March 6.** Broström Chapter 6: Parametric Models, Box-Steffensmeier and Jones Chapter 6: Issues in Model Selection, Box-Steffensmeier and Jones Chapter 8: Diagnostic Methods for the Event History Model. Assignment:
 1. Run each of the parametric models described in Broström Chapter 6.
 2. Demonstrate why one approach is better than the others.
- **March 13.** No class due to Spring Break.
- **March 20.** Presentation of Published Articles.
- **March 27.** Frailty models. Handout supplied with the reading. Assignment:
 1. Work on your paper and presentation.
- **April 3.** Basics of Time Series Analysis. Handout supplied with the reading. Assignment:
 1. Work on your paper and presentation.
- **April 10, 17, 24.** Presentations of Research Papers.