Advanced Topics in Maximum Likelihood Estimation:
Duration Analysis/Event History Analysis
Professor Brad Jones
University of Arizona
Weeks 2—3: August 1—12.

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Course Description
This section of the advanced MLE course will cover methods and models for duration data. Duration data record the length of time until some event occurs, for example, the termination of a cabinet government or the time until an unemployment spell ends. Because time-to-event occurrence is an important feature of these kinds of data, methods suitable to duration data are often referred to as event history analysis. In this course, we will consider a wide variety of event history modeling methods. Students will be asked to complete some problem sets that will involve estimating and interpreting event history models. “Tutorials” will be available to students that describe some implementation issues pertinent to these models. Additionally, some lecture notes will be available as well. Any material necessary for downloading will be available at my website: http://www.u.arizona.edu/~bsjones. From here, you will be able to follow a link to this course to access tutorials, lecture notes, and article manuscripts.

Readings
The primary text will be Box-Steffensmeier and Jones’ Event History Modeling: A Guide for Social Scientists (Cambridge University Press, 2004). In the daily itinerary of topics, several articles will also be listed. Many of these articles include applications. As I am a Political Scientist, many of the applications will be from Political Science, although I have identified several works from Sociology, Economics, and Demography. Regardless of the field, however, the core issues relevant to application and interpretation will be/should be transparent in these articles.

Requirements
Students are expected to do the assigned readings and pay attention in class. There will be two or three short problem sets. The problem sets will entail estimation and interpretation of a variety of duration models. Finally, students will be asked to turn in a short (1-2 page) research prospectus that outlines a research question(s) and hypotheses that could be appropriately tested using duration modeling techniques. I will discuss this in more detail on day one.
Itinerary
My principal goal is to give you an introduction to the fundamental elements of duration modeling and then consider in some detail parametric, non-parametric (via the Cox model), and “discretized” duration models for single-event and multi-event duration data. I do not assume any prior knowledge of event history modeling, though I obviously will assume knowledge of the basic principals of maximum likelihood estimation as well as a thorough understanding of the classical linear model and traditional binary link models (like logit or probit).

The following gives you the day-by-day itinerary of topics. There are two “classes” of readings each day: core and application. It is important that the core readings be completed in their entirety. Several applications are listed for each day’s topics. You will not have time to read each application; I recommend choosing a couple that may be of interest to you. Just about all of the application readings (as well as the core articles) are available from J-Stor (http://www.jstor.org). Applications are highly useful to read and I encourage you to read as many of these as you can. On my website, I have a working bibliography that includes references to the fundamental statistics papers and texts that you would absolutely need to become familiar with if you continued studying these kinds of models. The readings below are primarily drawn from the social sciences.

DAY 1: Monday, August 1
Preliminaries: Event History Data and the “Moving Parts” of Event History Analysis and an Introduction to Modeling Strategies

Core Readings:
• Box-Steffensmeier and Jones, Chapters 1—2.
• Alt, James E., Gary King, and Curtis S. Signorino. 2001. “Aggregation Among Binary, Count and Duration Models: Estimating the Same Quantities from Different Levels of Data.” Political Analysis. 9: 21--44.

Applications:
DAY 2: Tuesday, August 2
Describing and Modeling Duration Data: The Kaplan-Meier Estimator (and related estimators) and Parametric Models

Core Readings:
• Box-Steffensmeier and Jones, Chapter 3.

Applications:

DAY 3: Wednesday, August 3
Estimation and Model Selection Issues in the Application of Parametric Duration Models

Core Readings:
• Box-Steffensmeier and Jones, Chapter 3.

Applications
DAY 4: Thursday, August 4
The Cox Proportional Hazards Model

Core Readings:
• Box-Steffensmeier and Jones, Chapter 4.

Applications (Cox Model):

DAY 5: Friday, August 5
The Proportional Hazards Property and other Cox Model Diagnostics

Core Readings:
• Box-Steffensmeier and Jones, Chapter 8.

Applications:
• Box-Steffensmeier, Janet M., Dan Reiter, and Christopher J.W. Zorn. 2003. "Nonproportional Hazards and Event History Analysis in International Relations." *Journal of Conflict Resolution*. 

DAY 6: Monday, August 8
“Discretized” Duration Data and Associated Models

Core Readings:
• Box-Steffensmeier and Jones, Chapter 5.

Applications:

DAY 7: Tuesday, August 9
Model Selection Issues and Time-Varying Covariates

Core Readings:
• Box-Steffensmeier and Jones, Chapters 6—7.

Applications:

**DAY 8: Wednesday, August 10**

**Complicated Events Structures: Part 1**

**Core Readings:**
• Box-Steffensmeier and Jones, Chapters 9—10.

**Applications:**
• Murphy, Mike and Duolao Wang. 1998. “Family and Sociodemographic Influences on Patterns of Leaving Home in Postwar Britain.” *Demography.* 35: 293—305.

**DAY 9: Thursday, August 11**

**Complicated Events Structures: Part 2**

**Core Readings:**
• Box-Steffensmeier and Jones, Chapters 9—10.
• Cleves, Mario. 1999. “How Do I Analyze Multiple Failure-Time Data?” (From Stata FAQ; available on website).

**Applications:**

**DAY 10: Friday, August 12**
**Synthesis and Wrap-Up**
• Box-Steffensmeier and Jones, Chapters 11.