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0521837677 - Event History Modeling: A Guide for Social Scientists

Janet M. Box-Steffensmeier and Bradford S. Jones

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## Event History Modeling

*Event History Modeling* provides an accessible up-to-date guide to event history analysis for researchers and advanced students in the social sciences. The substantive focus of many social science research problems leads directly to the consideration of duration models, and many problems would be better analyzed by using these longitudinal methods to take into account not only whether the event happened, but when. The foundational principles of event history analysis are discussed and ample examples are estimated and interpreted using standard statistical packages, such as STATA and S-Plus. Recent and critical innovations in diagnostics are discussed, including testing the proportional hazards assumption, identifying outliers, and assessing model fit. The treatment of complicated events includes coverage of unobserved heterogeneity, repeated events, and competing risks models. The authors point out common problems in the analysis of time-to-event data in the social sciences and make recommendations regarding the implementation of duration modeling methods.

Janet M. Box-Steffensmeier is Vernal Riffe Professor of Political Science at Ohio State University. She was chair of the R.H. Durr Award Committee for the best paper applying quantitative methods to a substantive issue that was presented at the 2002 Annual Meeting of the Midwest Political Science Association in 2002–3. She is Vice President (2003–5) and a member of the Executive Committee of the Political Methodology Section of the American Political Science Association.

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Frontmatter

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# Event History Modeling

A Guide for Social Scientists

**Janet M. Box-Steffensmeier**

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Frontmatter

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0521837677 - Event History Modeling: A Guide for Social Scientists

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Frontmatter

[More information](#)

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To Michael, whose “duration” of love and support was unmeasurable, and to Andrew, Zachary, Nathaniel, and Elizabeth, the most exciting “events” and true blessings in my life.

—Jan Box-Steffensmeier

To Arlen, for her tremendous love and support, and to Mitchell, Daniel, and little Jackson, for their love and their ability to help me keep things in perspective. Also, to Grandpa.

—Brad Jones

Cambridge University Press

0521837677 - Event History Modeling: A Guide for Social Scientists

Janet M. Box-Steffensmeier and Bradford S. Jones

Frontmatter

[More information](#)

# Contents

<b>List of Figures</b>	<i>page</i> <b>viii</b>
<b>List of Tables</b>	<b>ix</b>
<b>Preface</b>	<b>xi</b>
<b>1 Event History and Social Science</b>	<b>1</b>
<b>2 The Logic of Event History Analysis</b>	<b>7</b>
<b>3 Parametric Models for Single-Spell Duration Data</b>	<b>21</b>
<b>4 The Cox Proportional Hazards Model</b>	<b>47</b>
<b>5 Models for Discrete Data</b>	<b>69</b>
<b>6 Issues in Model Selection</b>	<b>85</b>
<b>7 Inclusion of Time-Varying Covariates</b>	<b>95</b>
<b>8 Diagnostic Methods for the Event History Model</b>	<b>119</b>
<b>9 Some Modeling Strategies for Unobserved Heterogeneity</b>	<b>141</b>
<b>10 Models for Multiple Events</b>	<b>155</b>
<b>11 The Social Sciences and Event History</b>	<b>183</b>
<b>Appendix: Software for Event History Analysis</b>	<b>199</b>
<b>References</b>	<b>201</b>
<b>Index</b>	<b>213</b>

Cambridge University Press

0521837677 - Event History Modeling: A Guide for Social Scientists

Janet M. Box-Steffensmeier and Bradford S. Jones

Frontmatter

[More information](#)

## Figures

3.1	Weibull Hazard Rates by Conflict Type . . . . .	<i>page</i> 30
3.2	Hazard Rates for the Log-Logistic Model . . . . .	32
3.3	Hazard Rates for the Log-Normal Model . . . . .	34
4.1	Estimated Baseline Functions for Cabinet Data . . . . .	66
5.1	Cubic Spline, Lowess, and Log Transformation of Baseline Hazard . . . . .	77
5.2	Baseline Hazard Using Cubic Spline and Lowess . . . . .	80
6.1	Estimated Baseline Hazards for Policy Adoption Model . . . . .	92
7.1	Illustrating the Risk Profile for Selected Incumbent in Weibull Model . . . . .	107
7.2	Temporal Ordering of TVC and Event Time . . . . .	111
8.1	Adequacy of Cox Model . . . . .	125
8.2	Assessing Functional Form . . . . .	127
8.3	Assessing Influence . . . . .	129
8.4	Assessing Poorly Predicted Observations . . . . .	131
8.5	Plot of Deviance Residuals against Time . . . . .	132
8.6	Adequacy of Parametric Models . . . . .	138
10.1	Baseline Hazard for Conditional Model . . . . .	163
10.2	Baseline Hazards for Competing Risks Model . . . . .	172
10.3	Stratified Cox Competing Risks Model . . . . .	179

Cambridge University Press

0521837677 - Event History Modeling: A Guide for Social Scientists

Janet M. Box-Steffensmeier and Bradford S. Jones

Frontmatter

[More information](#)

## Tables

2.1	Example of Event History Data: Military Interventions . . .	<i>page</i> 9
2.2	Disputes between Nicaragua and Costa Rica . . . . .	11
3.1	Weibull Model of U.N. Peacekeeping Missions . . . . .	28
3.2	Log-Logistic and Log-Normal Models of Primary Exits . . . . .	37
3.3	Generalized Gamma Model of Cabinet Durations . . . . .	43
3.4	AIC and Log-Likelihoods for Cabinet Models . . . . .	45
4.1	Cox Model of U.N. Peacekeeping Missions . . . . .	49
4.2	Data Sorted by Ordered Failure Time . . . . .	52
4.3	Matched Case-Control Duration Data . . . . .	57
4.4	Cox Model of Cabinet Durations . . . . .	60
4.5	Cox and Weibull Estimates of Cabinet Duration . . . . .	61
4.6	Cox and Weibull Estimates of EU Legislation . . . . .	62
4.7	Cox Estimates of Transition to First Marriage for Males . . . . .	63
5.1	Example of Discrete-Time Event History Data . . . . .	70
5.2	Likelihood Ratios Duration Specification . . . . .	79
5.3	Models of Militarized Interventions . . . . .	82
6.1	Models of Adoption of Restrictive Abortion Legislation . . . . .	91
7.1	Example of Counting Process Data with a Yearly TVC . . . . .	100
7.2	Example of Counting Process Data with a Yearly TVC and Discontinuous Risk Intervals . . . . .	101
7.3	Example of Event History Data Set with TVCs . . . . .	102
7.4	Cox Model of Challenger Deterrence . . . . .	104
7.5	Weibull Model of Challenger Deterrence . . . . .	106
7.6	Logit Model of House Careers . . . . .	109
7.7	Robust Variance Estimation Using Lin-Wei Estimator . . . . .	116
8.1	Cox and Piecewise Cox Models of Supreme Court Retirement	134
8.2	Stratified Cox Models of Supreme Court Retirement . . . . .	135
8.3	Nonproportionality Tests of Supreme Court Retirements . . . . .	136

Cambridge University Press

0521837677 - Event History Modeling: A Guide for Social Scientists

Janet M. Box-Steffensmeier and Bradford S. Jones

Frontmatter

[More information](#)

---

x	Tables	
8.4	Nonproportionality Tests for First Transition to Marriage . . .	137
9.1	Frailty Model of Conflict . . . . .	146
9.2	Split Population Model of PAC Contributions . . . . .	153
10.1	“Time-from-Entry” Model Data Setup . . . . .	161
10.2	Conditional Gap Time Model for Repeated Events . . . . .	162
10.3	Event Strata for Intervention Data . . . . .	164
10.4	Cox Random Effect Models for Repeated Events . . . . .	165
10.5	Cox Competing Risks Model of Congressional Careers . . . .	170
10.6	Competing Risks Model of Congressional Career Paths . . . .	174
10.7	Example of Data for a Competing Risks Model . . . . .	176
10.8	Cox Competing Risks Model for Policy Adoption . . . . .	177

Cambridge University Press

0521837677 - Event History Modeling: A Guide for Social Scientists

Janet M. Box-Steffensmeier and Bradford S. Jones

Frontmatter

[More information](#)

## Preface

Our work on event history began in graduate school. We met as graduate students attending the Political Methodology Society's annual meeting in 1993 at Florida State University in Tallahassee, Florida. A small group of us at the meeting were interested in event history modeling and we saw its great potential for unlocking new answers to old questions and for revealing new questions in political science. We are indebted to the Political Methodology Group for bringing us together, providing a forum for us to present subsequent work, and providing ready and constructive critics and supporters. We are also indebted to our home departments for surrounding us with highly talented graduate students and interesting, stimulating colleagues. Meetings subsequent to our initial one in 1993, collaborations, and prodding from students and colleagues across the country who were interested in event history methodology, led to this manuscript.

This work has several goals. Our first goal in writing this book was to connect the methodology of event history to a core interest that social scientists, and indeed many scientists in fields as diverse as biostatistics and engineering, are interested in, namely understanding the causes and consequences of change over time. Scholars are commonly interested in "events." For example, political scientists who study international relations might investigate the occurrence of a militarized dispute or criminologists might study instances of victimization. Events such as these connote change and frequently, this concern with events is concomitantly tied to an interest in the "history" preceding the event. Understanding an "event history" entails a consideration of not only whether something happens, but also when something happens. Event history analysis, which is also referred to as survival, duration, and reliability analysis, is a growing but often underutilized, statistical approach for testing theories about dynamics in many areas of social science.

A second goal of the book is to present the fundamental steps when estimating event history models and to highlight the nuances of social science data that require special consideration. We challenge scholars to evaluate, justify, and test whether their modeling assumptions are valid. For example, we highlight the importance of checking the fundamental proportional hazards assumption and argue for more widespread use of the Cox model, which does not

Cambridge University Press

0521837677 - Event History Modeling: A Guide for Social Scientists

Janet M. Box-Steffensmeier and Bradford S. Jones

Frontmatter

[More information](#)

xii Preface

impose parametric assumptions on the data. Social science data also has inherently different characteristics that affect modeling choices. The repeatability of events in the social sciences is common (in contrast to the biological sciences where the typical study is of death, which only occurs once). Repeatability requires critical modeling adjustments to account for potential correlation over time. Such issues have been overlooked by much of the substantive literature applying event history models.

A third goal of the book is to provide a presentation that goes beyond introductory material so that scholars could use current statistical research conclusions to best answer their substantive questions. Interest in event history modeling is growing, and thus providing a reference book for social scientists was a timely and needed objective.

There are many people and institutions to thank for assisting us in this work. Janet Box-Steffensmeier would like to thank the National Science Foundation for financial support, specifically the Methodology, Measurement, and Statistics Program in the Division of Social, Behavioral, and Economic Research and Statistics and Probability Program in the Division of Mathematical Sciences (SES-0083418) as well as Ohio State University for their support of her sabbatical. Brad Jones would like to thank the National Science Foundation (SES-9708936) for its financial support during the early stages of this project. We owe a debt to our home departments of the Ohio State University and the University of Arizona for the rich and intellectually stimulating environment in which we are pleased to be working. Parts of this book were completed while Brad Jones was in the Political Science Department at the State University of New York at Stony Brook. Brad Jones would like to thank his colleagues in that department for their tremendous support. We also benefitted from presenting our work at several workshops and to several political science departments including the 2001 Speaker Series for The Center for Biostatistics and The School of Public Health, Division of Epidemiology and Biometrics, Ohio State University; State University of New York at Binghamton; Director's Series Luncheon at the Mershon Center, Ohio State University; Texas A&M University; University of California, San Diego; and the University of Kentucky.

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Cambridge University Press

0521837677 - Event History Modeling: A Guide for Social Scientists

Janet M. Box-Steffensmeier and Bradford S. Jones

Frontmatter

[More information](#)*Preface*      xiii

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