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Linear Modeling Wrap-up

Elizabeth Eli Holmes, NWFSC
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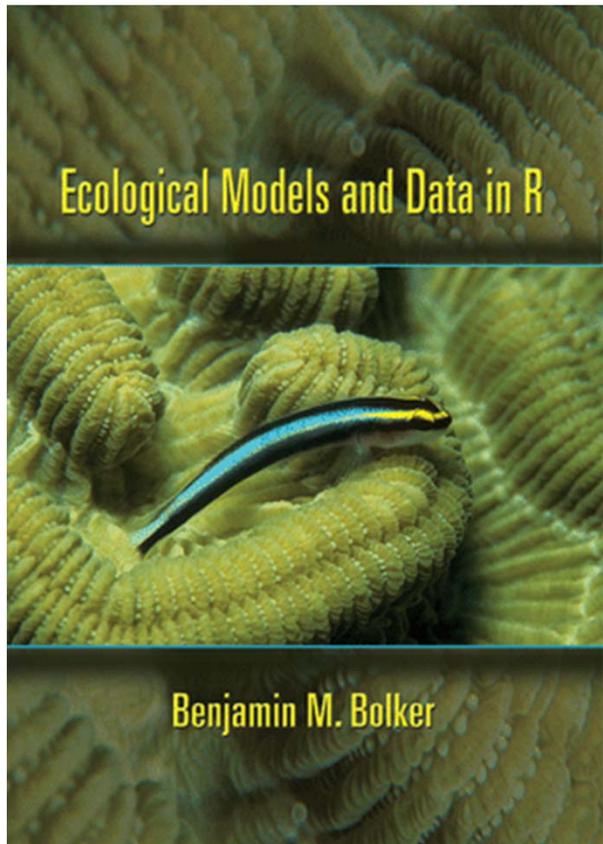
How to learn the basics of R

- There are many free resources for learning R. Use google/internet search and find one that works for you
 - “code academy r”
 - “r tutorial”
 - “introduction to r”
- Give yourself time. It takes some work in the beginning.

How to learn fisheries/ecological statistics and model fitting: introductory level

- In U.S., self-study by groups of graduate student/post-doctoral fellows is a common way to learn material not offered by their course work “graduate seminars” “reading groups”. Each student (or pair of students) signs up for a chapter and presents the chapter to the group each week.
- The following are books I worked through in graduate reading groups to learn ecological statistic and modeling (in addition to coursework).

Bolker, 2008, Ecological Models and Data and R



- Best book with which to start, in my opinion. Starts at entry level. Targeted for undergraduates and early level graduate students.
- Has a website with all the code and a R package with the data. Website has solutions to the problem sets.
- <http://ms.mcmaster.ca/~bolker/emdbook/>
- You can find a pdf of the book online.

Hilborn and Walters, 1997, The ecological detective: confronting models with data

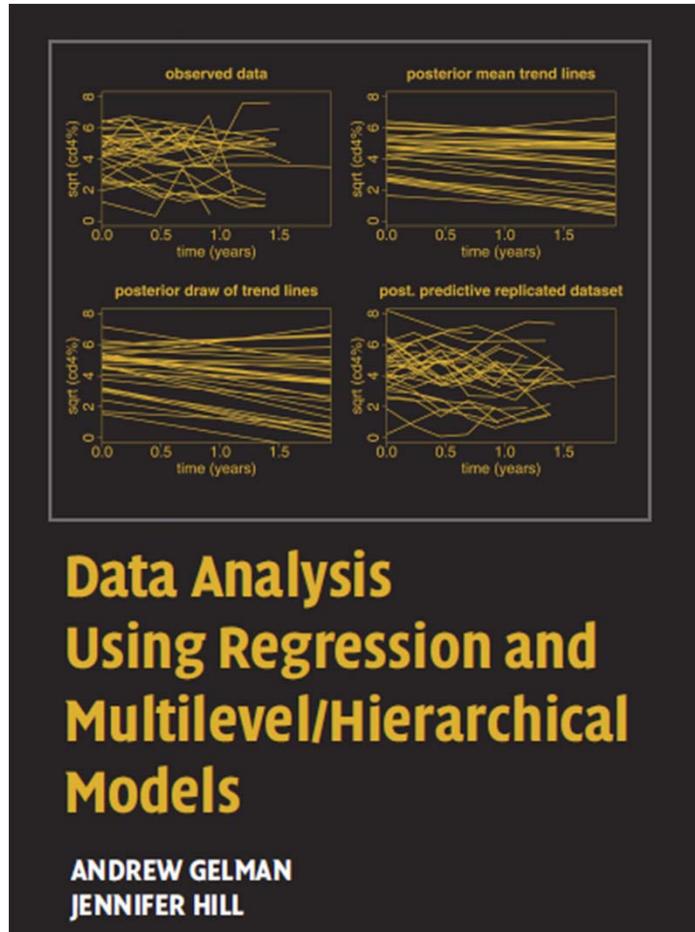


- This is not integrated with R, but is a 'classic' that almost all U.S. fisheries modelers will have studied as students
- Fairly easy read.
- Start with Bolker before this book. After Bolker, this book will be easy to understand.
- Note, modern fisheries statistical analysis uses Bayesian modeling in addition maximum-likelihood estimation (MLE). This book only covers MLE.
- You can find a pdf of the book online.

Next steps. Learning linear modeling and Bayesian modeling

- After working through the introductory books, over 3-5 months and working through the examples and problems in your reading group, you'll be ready to tackle material to help you analyze real data.
- The following are books are the 2 'next' steps books I recommend.

Gelman and Hill, Data analysis using regression and multilevel/hierarchical models

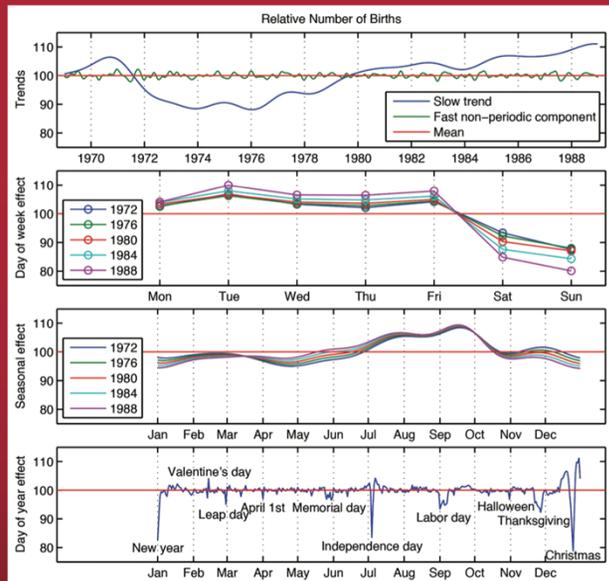


- This is the best book for learning how to do all types of model linear models
- If you want to look at the effect of, say, location, boat-type, environmental factors, species on some response, this is where you start
- Both MLE and Bayesian methods.
- Covers mixed effects/random effects models.
- Good website with all the code and data

Gelman, 2003, Bayesian data analysis

Bayesian Data Analysis

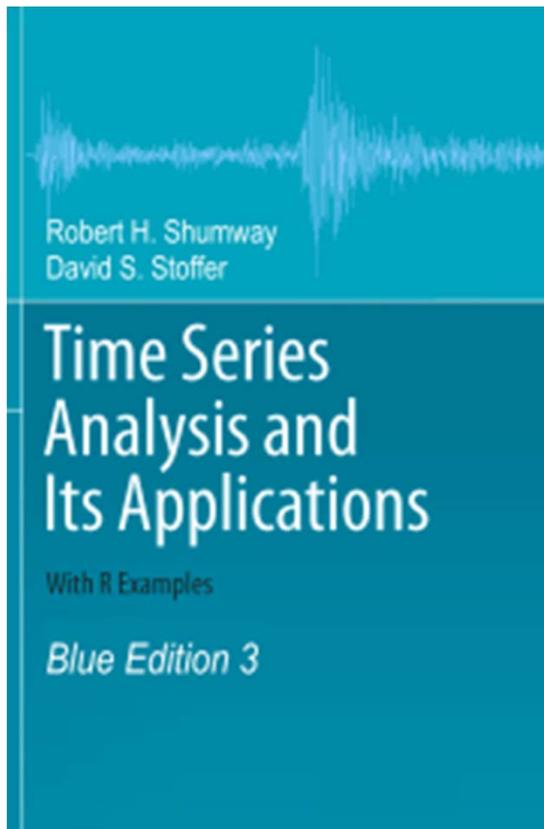
Third Edition



Andrew Gelman, John B. Carlin, Hal S. Stern,
David B. Dunson, Aki Vehtari, and Donald B. Rubin

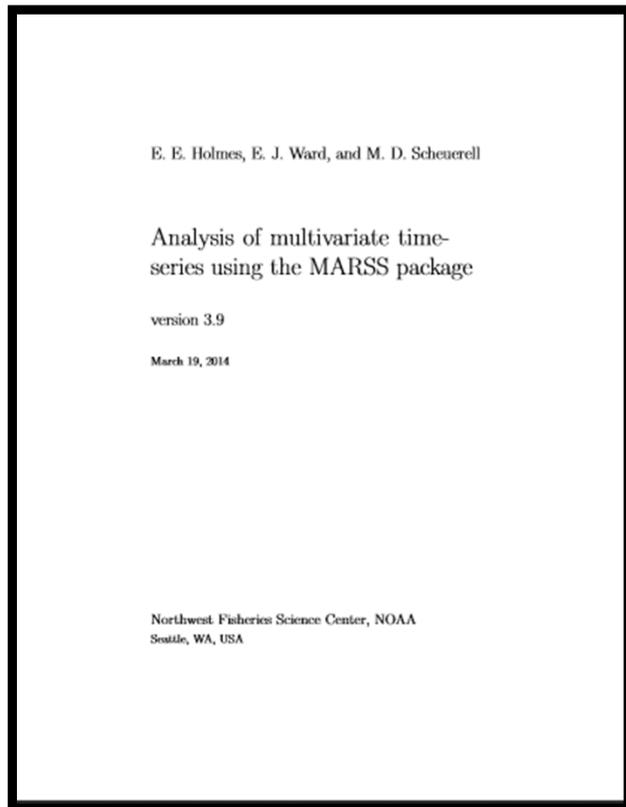
- Covers all aspects of Bayesian data analysis. Essential for students interested in modern fisheries stock assessment and modeling.
- Advanced book. I would work through Gelman and Hill first which is targeted to a slightly less advanced student.
- Good website with all the code, data, and lecture materials
- <http://www.stat.columbia.edu/~gelman/book/>

Shumway and Stoffer, 2015, Time series analysis and its application, with R examples



- This covers all the time series analysis you need for analysis of fisheries and environmental data.
- Has a website and R package with all the code.
- <http://www.stat.pitt.edu/stoffer/tsa3/>
- Has a free version of the book, edition 2 on the website.

Holmes, Scheuerell and Ward, 2015, MARSS user guide



- The user guide for the MARSS package has many chapters on typical time-series analyses in ecological studies
- Dynamic linear modeling, dynamic factor analysis, forecasting, etc.
- <https://cran.r-project.org/web/packages/MARSS/index.html>
- My website has links to online courses and lectures:
- <http://faculty.washington.edu/eeholmes> click on Teaching

A couple scripts on

[fishbox.nwfsc.noaa.gov/user/e2holmes/Teaching Materials](http://fishbox.nwfsc.noaa.gov/user/e2holmes/Teaching%20Materials)

- fitting seasonal models
- fitting logistic regression

