

Measurement in the Social Sciences

Trinity Term 2007 (Tuesdays 1100-1300, wks 1-4)

Dave Armstrong

University of Oxford

Department of Politics and International Relations

t: 01865 285956

e: david.armstrong@politics.ox.ac.uk

w: <http://users.ox.ac.uk/~polf0104>

Course Content and Motivation

With the accumulation of Social Science data, researchers continually encounter situations where they have more than one variable that measures the same underlying trait, characteristic or phenomenon. The problem is that each measure is an imperfect, error-laden realization of the underlying characteristic. Including each variable in a regression will result in 1) modeling the error in these variables and/or 2) a high degree of multicollinearity making estimation of any of the parameters attached to these variables very inefficient. The normal prescription for this problem is to either create an additive scale or do factor analysis or principal components analysis, however rarely is it the case that researchers understand the theoretical models and assumptions that have to be made to justify the use of these techniques. This class will shed light on both the theoretical and practical aspects of these models. At the completion of the course, the students should be able to employ, assess and write convincingly about these models in their own research.

A student attending this course should have a theoretical understanding of linear regression. We will build heavily on this foundation, but due to time constraints, I will not have time to engage in a review of this material. Students should also have some experience using a statistical software package (e.g., Stata, SPSS, SAS, R). The course will use Stata as its main statistical package, however, students will also be provided with examples from SPSS. While the support I can offer varies by statistical package, students are welcome to do analysis in whatever statistical package they choose.

Course Organization and Assessment

The course will meet four times for two hours each in the IT room in the Manor Road Building. In general, the first part of each session will focus on a theoretical model and the second part will focus on estimation and assessment of the model discussed in the first part of the class. Students being assessed will have an assignment that will be given in fourth week and due at noon on Friday of eighth week of Trinity Term 2007.

Course Outline

1. Week 1

- (a) Introduction to Measurement
- (b) The Summated Rating Model
 - What is Reliability?
 - Estimating Reliability
 - Caveats and Cautions

Suggested Reading:

McIver and Carmines (1981, p. 22-40)

Jacoby (1991, p. 38-41)

2. Week 2-3: Principal Components and Factor Analysis

- (a) Principal Components Model
- (b) Common Factor Model
- (c) Difference between PCA and CFM
- (d) Exploratory Factor Analysis vs Confirmatory Factor Analysis
- (e) Estimation of the Common Factor Model
- (f) Rotation and Scoring
- (g) Graphical Representation of Multivariate Data

Bartholomew et al. (2002, Chapters 5-6)

Lattin, Carroll and Green (2003, Chapters 4-5)

Jacoby (1991, p. 47-53)

Dunteman (1989)

3. Week 4: Cumulative Scaling

- (a) Guttman and Mokken Scaling.

McIver and Carmines (1981, Chapters 4-5)

Jacoby (1991, p. 41-46)

Mokken and Lewis (1982)

vanSchoor (2003)

- (b) Rasch Model

Bartholomew et al. (2002, Chapter 7)

- (c) Non-Parametric Models.

Sijtsma (1998)

References

- Bartholomew, David J., Fiona Steele, Irini Moustaki and Jane I. Galbraith. 2002. *The Analysis and Interpretation of Multivariate Data for Social Scientists*. New York: Chapman & Hall/CRC.
- Dunteman, George. 1989. *Principal Components Analysis*. Thousand Oaks, CA: Sage.
- Jacoby, William G. 1991. *Data Theory and Dimensional Analysis*. Thousand Oaks: Sage.
- Lattin, James, J. Douglas Carroll and Paul E. Green. 2003. *Analysing Multivariate Data*. Brooks/Cole - Thomson Learning.
- McIver, John P. and Edward G. Carmines. 1981. *Unidimensional Scaling*. Thousand Oaks: Sage.
- Mokken, Robert J. and Charles Lewis. 1982. "A Nonparametric Approach to the Analysis of Dichotomous Item Responses." *Applied Psychological Measurement* 7:45–55.
- Sijtsma, Klaas. 1998. "Methodology Review: Nonparametric IRT Approaches to the Analysis of Dichotomous Item Scores." *Applied Psychological Measurement* 22(1):3–31.
- vanSchoor, Wijbrandt H. 2003. "Mokken Scale Analysis: Between the Guttman Scale and Parametric Item Response Theory." *Political Analysis* 11:139–163.