Course description

This is the third year of the sequence of quantitative methods taught in the 8th semester of the Degree in Political Science and International Relations. The course objective is to learn appropriate statistical techniques for research questions are students and they could be implemented in Stata. (Unlike previous years, the statistical package R. was not handled) Special emphasis will be placed on the narrative and graphical interpretation of data. The final work will be a direct input for dissertations, so the sooner students enrolled databases, will draw most out of the course.

The class is divided into three parts: I) Review and Extension Ordinary Least Squares (OLS, in English), ii) presentation of Generalized Linear Model (GLM) and III) special topics. The class program is subject to change by the teacher or at the request of students.

The objectives of this course are:

- support and postgraduate students who are using quantitative methods in their undergraduate thesis or dissertation
- review and deepen the models covered in the course predecessor, "Applied Quantitative Methods".
- learn which models and techniques are most appropriate for the analysis of certain data
- Interpreting the results of an analysis of both narratively and graphically
- introducing new advanced topics, according to the needs of the class (as they can be models for endogeneity, multilevel modeling, design and analysis of experiments etc.)

Temary

The tentative course content is as follows (again, it can be modified according to the needs and pace of the class):

Week 1

Presentation of the course
PART I: Linear Models

Week 2

Do the groups are different? Review: hypothesis tests for two or more groups

- $\chi$-square
- ANOVA
- Test F
- $P$-values
- Current debate: criticism of the concept of statistical significance

To read: Lipschutz and Schiller, Caps. 10 and 11; Kline, Caps. 3 and 4

Week 3

Is it appropriate to the linear model? Review: Ordinary Least Squares (OLS)

- Normal equations
- Matrix representation
- Assumptions
- Results
  - Coefficients
  - standard error
  - t-statistic
  - p-value
- Diagnostics
- Goodness of fit

To read: Gujarati, Caps. 3.7 10-12

Week 4

Why change the coefficient of a variable when I put another? Logic covariance

- What you do "control by"?
- Correlation
- Partial correlation
- Direct, indirect and total effects
- Covariance
  - Suppressor variables
  - Omitted variable bias

To read: Gujarati: 1.5, pp. 23-24; 3.5, pp. 81-87 (correlation); 7.11, pp. 229-232 (partial correlation); 13.3-4, pp. 510-524 and Appendix 13A, pp. 556-557 (total effects, omitted variable bias).

Multiple Regression # 3 (class notes by David C. Howell):

http://www.uvm.edu/~dhowell/gradstat/psych341/lectures/MultipleRegression/multreg3.html
Indications are distributed to first task

Week 5
Does it vary the effect between groups? For different values of X?
Modifications to the linear model

- Effective Interactive
- Non-linear transformations of the variables
  - Terms quadratic
  - Logarithmic transformation

To read: Braumoeller; Gujarati 6.2-6.6, pp. 169-183; 9.6, pp. 310-312 and p. 590 (interactive effects).

Deadline for first task:

Week 6

Yes, but it's a really important effect? Effect size

- Significance vs. acoustic QUEUEANDSTATISTICSMAN substantiv significance to
- Tama lis effect: what is so great?
- Data interpretation or n
  - Predicted values
  - No interpretation or narrative
  - N gr interpretation or FICA in Stata to "predict" and "marginsplots"

To read: Caps Kline. 5-6 (and reread 3 and 4); Mitchell, Caps. 3, 12; Long and Freese, 3.6.2, pp. 116-117.

PART II: The Generalized Linear Model (GLM)

Week 7

What if my dependent variable is not continuous? One model for (almost) all categorical cases

- Typing variables
- Defining the appropriate model
- Common probability distributions
- Transformation of the dependent variable
- Link function ("link function")

To read: Olsson, Caps. 2, 3
First indications are distributed for exhibition

Week 8
Models for binary variables

- Linear probability model (LPM)
- Logistic model
- Probit model
- Likelihood function ("likelihood function") and maximum likelihood (MLE, "maximum likelihood estimation")
- Narrative and graphical interpretation of data
  - Predicted probabilities
  - Tables of first differences with "prvalue" and "prchange"
- Goodness of fit:
  - Deviance, X2
  - Reason verosimiu

To read: Long and Freese, 3.5-3.6, 4; Olsson Appendix B ("Inference using likelihood methods"); Powers and Xie, Ch. 3.

**Week 9**
Multicotómicas models variables

- Ordinal logistic model
  - Cumulative probabilities ("cumulative link function")
- Multinomial logistic model
  - IIA course
- Predicted probabilities and interpretation of data
- Narrative and graphical interpretation of data

To read: Powers and Xie, Ch. 6-7; Long and Freese, Caps. 5-6

**Week 10**
Models for frequencies and proportions

- Models for aggregated data
  - Logistic model for grouped data ("Grouped data logit model")
    "Glogit"
  - Loglinear models
  - Binominal model ("GLM")

To read: Olsson, Caps. 5.2, 5.7; Powers and Xie, 3.2.4, 4;

**Week 11**
Models for rates ("rates") and positive numbers

- Poisson model
  - Overdispersion
- Negative binomial model
• Gamma model
• Predicted values and interpretation of data

To read: Long and Freese, Cap. 8; Olsson, Cap. 6
Deadline for second task:

PART III: Special Topics

Week 12
Design and Analysis of Experiments I

• Randomization of the experiment
• Power analysis
• Simple design: treatment and control groups
• Sample analysis balance
• Average Treatment Effect (ATE)
  o Unlike differences
  o T-tests for differences in means
• What to do when the control and treatment groups are not equivalent?
  o Regression
  o "Matching"

To read: Gonzalez, Caps. 2, 4, 6; Rubin 3-4
Indications are distributed to second exhibition

Week 13
Design and Analysis of Experiments II

• Design of a single factor, three or more treatments
  o ANOVA
  o Test-F
  o Contrasts (with Bonferroni adjustment)
• Design multifactoria
  o 2 x 2
  o Multi-way ANOVA
  o Loglinear regression models

To read: Gonzalez, Caps. 7-10

Article second exhibition:
Week 14
1 models for longitudinal data

• Autoregressive models
• Distributed lags models
  o Autoregressive Distributed Lag Model (ARDL)
• Serial autocorrelation
  o Diagnostics
  o Corrective techniques
To read: Gujarati, Cap. 17
Indications are distributed to third task
Week 15
II models for longitudinal data

- Random models / multilevel effects
  - Random intercepts
  - Random coefficients
  - Intraclass correlation coefficient
  - Variance components

To read: Singer and Willet, Caps. 3, 4
Deadline for third task:
Week 16

Review
Indications are dealt to work / final task
Deadline for work / final task:

Bibliography
We use the following books and articles on the course.


