Quantitative Methods for Fire and Emergency Management
POLS 6123: Fall 2011

Ole J. Forsberg, Ph.D

Class

MUR 232 (and by link)

T 19:20 – 22:00

Office

MSCS 309

By Appointment

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http://courses.kvasaheim.com/pols6123/

Purpose and Content of the Course

The purpose of this course is to increase the skills of the students with respect to using statistical processes and techniques to glean more information from their collected data about the real-world process under investigation. This course builds upon previous graduate and undergraduate method fire and emergency management courses, including (but not limited to) POLS 5013 (Quantitative Methods of Political Analysis). This includes knowledge of the STATA statistical program, of descriptive statistics, of contingency tables, and of linear regression.

This course emphasizes descriptive, inferential, parametric, and non-parametric statistics for use in analyzing data relevant to the discipline, as well as how to determine the appropriate statistical method(s) when faced with data from a specified real-world process.

Required Textbooks and Materials

Textbook: Peter Kennedy. (2008) *A Guide to Econometrics*, Sixth Edition. New York: Wiley-Blackwell.

Supplement: Ole J. Forsberg. (2011) *R for Starters*, Version 0.577.

<http://oforsber.kvasaheim.com/rfs/>

Software: A statistical software package from the following list: R, SAS, SPSS, or STATA.

A spreadsheet program

A word processor or typesetting program

Optional Textbooks and Materials

Textbooks: Neil J. Salkind. (2008) *Statistics for People Who (Think They) Hate Statistics*, Third Edition. Sage Publications.

W. N. Venables, D. M. Smith, and the R Development Core Team. (2009) *An Introduction to R.*

<http://cran.r-project.org/doc/manuals/R-intro.pdf>

Software: LaTeX typesetting program (usually through the MiKTeX distribution) and a text editor.

Quizzes and examinations

Each week, a quiz will be posted to D2L for you to take. Each quiz will be worth 10 points and must be completed between Friday morning at 1:00am and Sunday night at 11:59pm. The quiz should be completed *after* you complete your homework; the homework will help you do better on the quizzes.

The quizzes will consist of multiple choice questions and will be open-note, open-books, and open-Internet. You may receive help from anything that does not breathe.

Homework

Each weekly homework assignment will have several problems. The assignment will be posted every Monday to the website and be due (emailed to the professor at the above address) by Sunday at 11:59pm. I recommend that you read through the homework before the class on Tuesday night.

Each homework assignment is worth 25 points. Please follow the directions on the homework carefully. As the homework is submitted through email, you will need to type it. You may use any word processor or typesetting program.

Research Paper

There is a research paper requirement for this course.

The structure of the paper is standard with two exceptions: the literature review will be a "pseudo" literature review and the methods and discussion sections should be longer and more detailed (especially in the explanations) than in your previous papers.

The pseudo literature review (PLR) is to be much shorter than the usual literature review. In consists of several sections, each discussing the literature behind a single research variable or control variable. Each independent variable you are including in your

analysis needs its own section. Within each section, you need to cite sources as to why that particular variable should be the research variable (or control variable) in your model as well as the expected direction of effect. Be brief. There should be approximately one page per variable.

The number of peer-reviewed sources *must be* greater than 15, but *should be* greater than 20 for a paper and for research of this quality.

The schedule for due dates for the constituent parts of the research paper is included here. For each of the due dates, the item needs to be emailed to the professor, who will grade the sections based on an S/NS scale — no points, no effect on your grade. Do not think of these checks as burdensome; think of them as places for guidance in your quest to do good research. What you hand in will receive feedback; it may be discussed during the class session among the members of the class.

Date		Item due
August	28	Research question
October	2	Hypotheses determined Pseudo Literature Review Data source(s) identified
October	16	Data collected Data Description Statistical Methods identified
October	23	Data Analysis
November	8	Rough Drafts (Group I)
	15	Rough Drafts (Group II) Presentations (Group I) Critiques of Group I
November	17	Presentations (Group II) Critiques of Group II
December	13	Final draft due 8:00 pm

Note: The draft of your research paper will be distributed to all members of the class the *week before* you present. The other class members will analyze your paper and give appropriate feedback (see "Critique," below). You, then, use that feedback to improve your paper. This improved paper is what you hand in as the final draft.

Note: The groupings will be assigned at a later date to take into consideration the relationships among the topics chosen by the students.

Critique

You are required to do analyses of **every paper** except your own. These analyses should be approximately two (2) pages long. The four sections you need to include are a summary of article, general comments about the literature used (including weaknesses), comments about the statistical methods used (including weaknesses), and a brief conclusion emphasizing the most important points of your analysis.

When you have completed your analysis, please email it to the professor *and to the colleague* whose paper you are critiquing (before the start of the class period when due). These are worth 10 points each. Your colleague will then use the feedback to improve his or her paper for the final draft.

Overall Course Grade

Creating grading schemes is always a difficult task. There is a desire to reward students for hard work, but there is also a desire to provide grades that are reflections of the student's skills and abilities on the last day of the course. Compared to grading schemes, making assignments is easy.

The idea behind grades is to quantify (via a letter) your state of knowledge about the subject matter as defined by the professor. This means your overall knowledge (suitably interpolated and inferred, if need be). To that end, I will use the following grading scheme:

Mean quiz score	____ x 10	= _____ / 100
Mean homework score	____ x 8	= _____ / 200
Final project score	____ x 2	= _____ / 200

The maximum value for the sum of these three values is 500. Your letter grade will be the percentage of points you earned with respect to that maximum value: 90% and above = A; 80 – 90% = B; 70 – 80% = C; 60 – 70% = D; below 60% = F.

Course Schedule

Of course, this schedule is subject to change as necessary. The current (updated) schedule is always posted to the website. The readings listed are the readings to be discussed that class period. Those topics marked (?) are optional and may be dropped.

Date		Readings	Topics
August	23	Forsberg: Ch 1, 2, B Kennedy: Ch 1, 22	Course introduction, the R statistical environment, showing your work, tests for measures of central tendency, boxplots, validating tests, Monte Carlo techniques
	30	Forsberg: Ch 3, A1, A4 Kennedy: Ch 2	Analysis of Variance, tests for measures of central tendency, tests of Normality, non-parametric tests
September	6	Forsberg: Ch 4, A4 Kennedy: Ch 3, 4	Classical Linear Model, Ordinary Least Squares, assumptions and testing of assumptions, multi-colinearity, homoskedasticity, using Monte Carlo to answer different questions, graphing results
	13	Forsberg: Ch 5 Kennedy: Ch 12, 15	Transformations of dependent variables, using Monte Carlo to answer different questions, graphing results
	20	Kennedy: Ch 6	More with transformations and linear models, cross validation (?)
	27	Kennedy: Ch 17	Mid-Semester Review and Lab I
October	4		Presentation of Pseudo Literature Reviews
	11	Forsberg: Ch 6, A4 Kennedy: Ch 6	Generalized Linear Models, Gaussian distribution, Akaike and Bayesian information criterias
	18	Forsberg: Ch 7, A1	Binary dependent variables, accuracy, receiver operating characteristic curves, LOOCV (?)
	25		Binary dependent variables, continued
November	1	Forsberg: Ch 9	Multinomial and ordinal response dependent variable

Date		Readings	Topics
November	8	Forsberg: Ch 8, A2	Count dependent variable, Poisson and Negative Binomial distributions, quasi-likelihood estimation Rough Drafts I due
	15	Forsberg: Ch 10, A7	Presentations, Group I Rough Drafts II due Failure time analysis (?)
	22	Kennedy: Ch 19, 20	Presentations, Group II Time series analysis (?)
	29	Kennedy: Ch 18	Cross-sectional time series analysis (?)
December	6	Kennedy: Ch 22	Final Semester Review and Lab III
	13	Research Paper	Final draft due 8:00 pm

Ethics

Feel free to discuss the assignments, research, and other aspects of the course with your peers. However, when you actually do the work, you need to do it on your own. This includes the time you spend working through the problems as well as the time you spend writing up your homework assignment.

Academic Integrity

The following statement regarding academic integrity is the statement that OSU suggests all professors place in their syllabus:

> Oklahoma State University is committed to the maintenance of the highest standards of integrity and ethical conduct of its members. This level of ethical behavior and integrity will be maintained in this course. Participating in a behavior that violates academic integrity (e.g., unauthorized collaboration, plagiarism, multiple submissions, cheating on examinations, fabricating information, helping another person cheat, unauthorized advance access to examinations, altering or destroying the work of others, and fraudulently altering academic records) will result in your being sanctioned. Violations may subject you to disciplinary action including the following: receiving a failing grade on an assignment, examination or course, receiving a notation

Final Thoughts

The purpose of statistics is to gain information about the underlying real-world process you are studying. As we explore the topics in this course, you will begin to ask which technique is the best technique. The short answer is that (in general) there is no "best" technique, only a series of techniques with different assumptions that get a person closer to understanding your real-world process.

The key to succeeding in statistics is to know the answers to three questions:

1.   What is the real-world process I am interested in?

2.   How are the data collected?

3.   What do I want to know about the real-world process?

Once you have answered these three questions, and only then, you can select several statistical techniques (based on your answers to Questions 2 and 3) to connect Question 3 with Question 1. Remember, statistics concerns itself with helping one learn about the real-world; it means nothing without reality.