

UAP 5494
Advanced Quantitative Techniques for Urban Research
Professor Casey Dawkins

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Office hours:	MW 10:00 – 12:00 or by appointment (Tentative)

Course meeting times:	MWF 9:05 a.m. - 9:55 a.m. (Tentative)
Location:	Architecture Annex 1 and 114

Course Description

This course provides an introduction to advanced quantitative analysis techniques commonly utilized in urban planning and policy analysis. The majority of the course will focus on the multiple linear regression model, including the algebraic derivation of the ordinary least squares (OLS) estimator, advanced methods of hypothesis testing, and the implications of violating the assumptions of the classical linear regression model. During the second portion of the course, we will discuss several statistical models that extend and move beyond the OLS regression model. Throughout, emphasis is placed on computer implementation of the techniques learned.

Course Objectives

The course has the following objectives:

1. Open the “black box” of the multiple linear regression model and develop an advanced understanding of regression-based approaches to analyzing urban problems.
2. Provide an introduction to advanced quantitative techniques that extend and move beyond the linear regression model.
3. Develop a working knowledge of Excel and SPSS software packages and learn elegant methods of computation in those environments.
4. Learn to apply the techniques learned towards specific applied planning and policy analysis problems.

Prerequisites

UAP 5224 or equivalent course providing an introduction to statistical methods, including probability, statistical inference, and statistical estimation. A working knowledge of matrix algebra and calculus is helpful but not required.

Course Requirements and Policies

Grading:

Five take-home assignments will be distributed throughout the semester to evaluate students' understanding and comprehension of material presented in class. Each assignment is worth 20 percent of the student's final grade.

Policy on Late or Missed Assignments

All work must be submitted by the due date. Work that is submitted late will receive reduced credit, except in highly unusual instances. Usually, ten percent of the total possible points will be deducted for each school day that an assignment is late. It is extremely important that you stay current in this course. Once you fall behind, it is difficult to get caught up, due to the pace of the course and the cumulative nature of the material.

Attendance Policy

You are responsible for all material discussed in class.

Special Needs of Students

If you need course adaptations or accommodations due to a disability, if you have any emergency medical information that the course instructor should know about, or if you need special arrangements in the event the building must be evacuated, please consult Professor Dawkins to make necessary arrangements. Virginia Tech procedures regarding students with disabilities are detailed on the following website:

<http://www.ssd.vt.edu/accommodationsmain.htm>.

Policy on Plagiarism and Academic Honesty

The Virginia Tech Honor System is in effect for this course. Please take the time to read this document and make sure that you understand your responsibilities as a student. The Graduate Honor System can be accessed online at <http://filebox.vt.edu/studentinfo/gradhonor/>. The Undergraduate Honor System can be accessed online at <http://www.honorsystem.vt.edu/>. The following statement, taken from the Graduate Honor System, describes the types of violations covered under the Honor System:

All forms of academic work performed by any graduate student enrolled on a part-time or full-time basis under any of the admission categories shall be subject to the stipulations of the Graduate Honor Code. Such work includes, but is not limited to, course work, labwork, thesis or dissertation work, research, teaching, and extension. Violations of the Graduate Honor Code are categorized as follows: *Cheating, Plagiarism, Falsification, and Academic Sabotage* Cheating is defined as the giving or receiving of any unauthorized aid, assistance, or unfair advantage in any form of academic work Plagiarism is a specific form of cheating, and is defined as the copying of the language, structure, idea, and/or thoughts of another and claiming or attempting to imply that it is one's own

original work Students who falsify, orally, in writing, or via electronic media, any circumstance relevant to their academic work shall be guilty of a violation of this Code Academic sabotage is purposeful vandalism directed against any academic endeavor or equipment (from the Virginia Tech Graduate Honor System, accessible online at: <http://filebox.vt.edu/studentinfo/gradhonor>).

Be advised that plagiarism or other forms of violations of the Virginia Tech Honor System will not be tolerated.

Computer requirements:

Course assignments will be completed using Excel and SPSS software packages. PC versions of these packages are available on all computers in the AA 1 computer lab.

Course Readings

Required course text:

Gujarati, Damodar N. (2003). *Basic Econometrics, 4th Edition*. Boston: McGraw Hill.

Other assigned course readings will be posted within Blackboard. Remember to check Blackboard frequently for assigned supplemental online readings.

Blackboard

The Virginia Tech *Blackboard* will be an important component of this course. Blackboard is an online environment created for use by Virginia Tech students and faculty. Each course is assigned a separate *page* within the Blackboard system and is accessible only by the course instructor and the students enrolled in the course. This system provides a convenient way to post announcements, grades, assignments, and online quizzes or homework. You are responsible for any announcement or assignment posted on Blackboard, regardless of whether the announcement or assignment was discussed in class, so check Blackboard often! Blackboard can be accessed at: <http://www.learn.vt.edu>. The following online help page provides additional information about accessing and navigating the Blackboard environment: <http://www.edtech.vt.edu/blackboard/help/>.

In this course, Blackboard will be used primarily for the following tasks:

Announcements

Changes to the syllabus, changes to the reading list, clarifications of lecture notes, and various other announcements will be posted under the “Announcements” tab. Check this often.

Course Information

Here, you will find the course syllabus, links to pdf versions of assigned supplemental readings, and other course material.

Tools

Course grades can be accessed through this tab, so check often to ensure that you are up to date on all graded assignments. Although each student will be given the option of viewing only his or her own grades, descriptive statistics for the entire class may be displayed periodically.

Resources

Web links to data and statistical resources will be posted in this section.

Tentative Course Outline and Reading List

(Readings followed by “**B**” can be accessed from Blackboard. Readings followed by “**P**” will be presented by students in class.)

Week 1: Matrix algebra review

Gujarati (App. B)

Matrix algebra handout **B**

Week 2: Matrix algebra review / Advanced probability

SPSS Advanced Statistics, pp. 87-88, 469-513 **B**

Gujarati (App. A)

Advanced probability concepts handout **B**

Week 3: OLS regression model: The basics

Gujarati (Ch. 7, App. C)

Multiple linear regression handout 1 **B**

Multiple linear regression handout 2 **B**

Week 4: OLS regression model: Tests of joint hypotheses

Gujarati (Ch. 8)

Multiple linear regression handout 3 **B**

Song and Knaap, 2004 **B**

Week 5: Violating OLS regression assumptions: multicollinearity

Gujarati (Ch. 10)

Pidot, 1969 **B**

Week 6: Violating OLS regression assumptions: nonscalar covariances

Gujarati (Ch. 11, 12)

Stevenson, 2004 **B**

Week 7: Violating OLS regression assumptions: endogeneity

Gujarati (Ch. 18, 20)

Dawkins, 2005 **B**

Week 8: Spring Break

Week 9: Qualitative response models

Gujarati (Ch. 15)

Freeman and Braconi, 2004 **B P**

Week 10: Qualitative response models

Gujarati (Ch. 15)

Somerville and Mayer, 2003 **B P**

Friday: NO CLASS

Week 11: Qualitative response models, Advanced topics

Gujarati (Ch. 15)

Dawkins, 2005 **B P**

Week 12: Spatial analysis

Anselin, "Spatial Econometrics," in Baltagi, 2001 **B**

Gujarati (Ch. 16)

Week 13: Spatial analysis

Baltagi, 1999 (Ch. 10) **B**

Watts, 1991 **B P**

Friday: NO CLASS

Week 14: Spatial Analysis

Spatial Autocorrelation Reading TBA

Dubin, 1998 **B P**

Week 15: Spatial Analysis, Advanced topics

Spatial Analysis Readings TBA

Week 16: In-class discussion of assignment 4 / Course wrap-up