# PUBP 602 Quantitative Methods I

Fall 2012, Section 01, CRN 10558

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*Course Meetings:* 201 Morton Hall, M 10-10:50am and W 9-10:50am
*Office Hours:* T 12:30-2:00pm, F 2:00-3:30pm, and by appointment
*Teaching Assistant:* Brooke Wanlass, bewanlass@email.wm.edu, office hours MW 3:30-5:00pm

## 1. Course overview

Quantitative evidence has become increasingly important for informing solutions to challenging policy problems. However, statistics do not "speak for themselves." If poorly generated they mean nothing or can do great harm. If poorly presented or explained they can misinform, mislead, or confuse their audiences. Thus, possessing the ability to create, interpret, and present quantitative evidence is essential for anyone beginning a career in public policy. Even if you never personally generate statistical results after you leave William & Mary you will inevitably have to evaluate the quantitative findings of others.

With that preface let me welcome you to PUBP 602. This class serves four important purposes. First, it provides an introduction to applied statistical methods. Second, it prepares students for more advanced statistics courses. Third, it emphasizes writing about and communicating statistical results to readers who may lack statistical training. Finally, it will help you develop the habits of mind that will make you careful users of data and statistical computing. To serve those ends, in this class you will develop quantitative skills by actually practicing them.

Some of you may possess little or no quantitative background. That's okay. The work is challenging, but not impossible. If you already have statistical experience, please talk with me immediately to determine whether you should take this course.

## 2. Course materials

### *2.1 Readings*

We will use the following required text in PUBP 602 and PUBP 603.

- Jeffrey M. Wooldridge. 2009. *Introductory Econometrics, A Modern Approach, 4th edition.* ISBN 9780324581621

These great supplemental references are free.

- Online Statistics: An Interactive Multimedia Course of Study. http://onlinestatbook.com/index.html.
- StatSoft. The Electronic Statistics Textbook. http://www.statsoft.com/textbook/stathome.html.
- UCLA Academic Technology Services. Resources to help you learn and use Stata. http://www.ats.ucla.edu/STAT/stata/.

### *2.2 Software*

As I mentioned during orientation week, we will use the software program Stata in PUBP 602, PUBP 603, and in your other courses such as the Policy Research Seminar. I *strongly* urge you to purchase the program. Fortunately it is available at a discounted rate through the Stata GradPlan. Here's how to purchase it:

- Surf to http://www.stata.com/order/new/edu/gradplans/gp-campus.html.
- On that page, I would recommend purchasing Stata/IC 12 with perpetual license ($179.00) or Stata/SE 12 with perpetual license ($395.00).
- Do NOT buy Small Stata 12. It has very limited capabilities.
- Pick up your order at the Information Technology office in Jones Hall, next to Morton.

## 3. Assignments and grading

### *3.1 Grading*

I will calculate course grades based on the following items. You need to complete all items to receive course credit. Students not completing all items will receive an Incomplete.

| Percent | Item |
|---|---|
| 20 | Homework assignments (4 @ 5% each) |
| 30 | Exam 1 |
| 30 | Exam 2 |
| 20 | Final paper |

In general, I will base grades on the following percentage scale with partial-percents typically rounded to the nearest full percent: A=93-100; A–=90-92; B+=88-89; B=83-87; B–=80-82; C+=78-79; C=73-77; C–=70-72; D+=68-69; D=63-67; D–=60-62; F<60.

In a graduate class such as this, any grade below a "B" on any assignment, exam, or paper suggests that a student is having trouble grasping basic course ideas, which are essential building blocks for future courses and the work world. Please talk with me or Brooke (or both) if you find yourself having difficulty.

Finally, because errors sometimes creep into grade calculations (and on rare occasions assignments are misplaced after they have been handed in) please keep a copy of all work submitted for this course until final grades have been processed.

### *3.2 Homework assignments*

These assignments will focus on real life policy questions. It is crucial that you complete these assignments on time. Grading will stress two things: (1) the degree to which you have made a strong effort to complete all parts of each assignment; and (2) the extent to which your work, especially the statistical computing component and the writing component, is polished and professionally done.

### *3.3 Exams*

We will have two take-home exams. Both will ask you to perform calculations and will emphasize interpreting results. The exams will be open-book and open-note.

### *3.4 Final Paper*

The course's capstone paper will provide you an opportunity to use your quantitative skills in an area that you choose. I will make some data sets available but you may also use data from another source. More details about the paper will be forthcoming.

## 4. Other important notes

### *4.1 Daily class operation*

You will develop professional habits of mind and get the most out of class by doing these things.

The night before class:

- Do the readings. Even skimming the relevant pages for 15 minutes will be worth it. Do not expect to understand the material after only one read.
- Check Blackboard for files to download for class. Download handouts, data sets, and Stata .do files to your laptop or your personal H:\ drive. *I strongly encourage you to print out the .pdf handouts that I post to Blackboard*.
- Charge your laptop battery. Unfortunately, outlet power is not always conveniently located in our classroom, so don't rely on plugging in your machine during class.

At the beginning of each class before lecture begins:

- Arrive on time and quietly take your seat if you are late.
- Have Stata running on your laptop computer or be sitting next to someone who does.
- Close your email and Internet entertainment and disable all other electronic distractions.

During class:

- Ask questions when you do not understand something.
- Do not attend to email, the Internet, or other electronic distractions.

### *4.2 Appropriate use of computers in class*

As section 4.1 suggests, your laptops will be powerful educational tools for this class. However, do not let them distract you, your fellow classmates, or me from our in-class work. Students who use laptops in class inappropriately suggest that they possess neither the intellectual focus nor the respect for others needed to do real professional work. Those students end up developing reputations that make it difficult for faculty members to give them strong recommendations to other professors and future employers.

### *4.3 Academic misconduct*

I begin each semester by assuming that academic misconduct will not be an issue, but as a policy matter I mention this on every syllabus. For any questions about policies regarding cheating, plagiarism, or other types of misconduct, please refer to the web site of the William & Mary Honor Council and the relevant pages about the Honor Code from the Student Handbook. If I discover a student violating the Honor Code I will initiate an Honor Council proceeding and, at a minimum, recommend to the Council that the student receive an "F" for the course. I take this issue extremely seriously, and hope you do, too.

### *4.4 What you can expect from me*

So far I have said a lot about what I expect from you. A fair question, though, is: What can you expect from me? First, and above all, I will not ask you to do things that waste your time. In

fact, everything I will teach or require of you is based on practices of the best professional policy analysts and academic researchers. In my own work I try to live up to the standards I will be teaching you. Second, Brooke and I will offer lots of honest feedback in office hours, via email exchanges, and on your written work. If our comments seem confusing, harsh, or unclear then let's talk it over. Finally, I promise to treat you and your ideas with fairness and respect.

# 5. Schedule

We will adjust this schedule as needed. Any changes to assignment or exam due dates will provide you with more time, not less time, to complete the work. You'll notice that the reading assignments repeat for some days. That is intentional because re-reading certain pages in a new context will help to deepen your understanding of prior concepts while establishing new ones.

## *5.1 Introduction*

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| W<br>8/29 | Course and Stata overview |

## *5.2 Data Description*

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| M<br>9/3 | Variable types<br>• StatSoft. Read the section on this page called "Measurement Scales": http://www.statsoft.com/textbook/elementary-statistics-concepts/. |
| W<br>9/5 | Describing one variable: Quantitative summaries and Stata basics<br>• Wooldridge, pp. 695-697. Focus on his discussion of "average" and "median" (section A.1. The Summation Operator).<br>• UCLA Academic Technology Services. "Descriptive information and statistics," http://www.ats.ucla.edu/stat/stata/modules/descript.htm .<br>• UCLA Academic Technology Services. "Labeling data," http://www.ats.ucla.edu/stat/stata/modules/labels.htm.<br>• UCLA Academic Technology Services. "Creating and recoding variables," http://www.ats.ucla.edu/stat/stata/modules/vars.htm. |
| M<br>9/10 | Describing one variable: Probability distributions<br>• Wooldridge, pp. 714-719 (B.1 Random Variables and Their Probability Distributions), and pp. 722-729 (B.3 Features of Probability Distributions).<br>• Online Statistics, "Basic concepts," http://onlinestatbook.com/chapter5/basic.html. |
| W<br>9/12 | Describing one variable: Probability distributions (cont.)<br>• Re-read Wooldridge, pp. 714-719 (B.1 Random Variables and Their Probability Distributions), and pp. 722-729 (B.3 Features of Probability Distributions).<br>• National Institutes of Standards and Technology, "Gallery of distributions" at http://www.itl.nist.gov/div898/handbook/eda/section3/eda366.htm. Do two things here: (1) Look at the visuals (you can ignore the formulas for now) for these distributions: normal, t, F, chi-square, and Poisson. How would you describe them? (2) Try to understand the distinction between these terms used to describe each distribution: "Probability Density Function" and "Cumulative Distribution Function." |

**Friday, September 14. HOMEWORK #1 DUE TO BROOKE BY 5PM**

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|---|---|
| M<br>9/17 | Describing one variable: Visual display using Stata's graphics commands<br>• UCLA Academic Technology Services. "Introduction to graphs in Stata," http://www.ats.ucla.edu/stat/stata/modules/graph8/intro/graph8.htm. Study the first three graphs shown (histogram and the two box-plots). How would you describe them? |
| W<br>9/19 | Describing relationships between two variables: Contingency tables<br>• Wooldridge, pp. 719-722 (B.2 Joint Distributions, Conditional Distributions, and Independence). |
| M<br>9/24 | Describing relationships between two variables: Scatterplots and correlation<br>• Wooldridge, pp. 729-731 (B.4 Features of Joint and Conditional Distributions, sections on "covariance" and "correlation coefficient").<br>• UCLA Academic Technology Services, "Introduction to Graphs in Stata," http://www.ats.ucla.edu/stat/stata/modules/graph8/intro/graph8.htm. Study the fourth thru seventh graphs. |
| W<br>9/26 | Describing relationships between two variables: Scatterplots and correlation (cont.) |

**Friday, September 30. HOMEWORK #2 DUE TO BROOKE BY 5PM**

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|---|---|
| M<br>10/1 | In-class exercise: Setting budget priorities to address national needs |
| W<br>10/3 | Describing relationships between two variables: Regression<br>• Wooldridge, pp. 697-699 (section A.2. Properties of Linear Functions) and pp. 733-734 (B.4 Features of Joint and Conditional Distributions, section on "conditional expectation"—stop reading before getting into "properties of conditional expectation").<br>• Wooldridge, Chapter 2. The Simple Regression Model, sections 2.1, 2.2 (study the figures; you can skim the text), and 2.3. |
| M<br>10/8 | Describing relationships between two variables: Regression (cont.)<br>• Re-read the assignment from 10/3. Be sure that you can interpret the results in Example A.2 (p. 699) without any difficulty.<br>• Woodridge, pp. 699-702 (A.3 Proportions and Percentages). Be sure you understand the difference between a "percent" and a "proportion," and the difference between "percentage change" and "percentage point change." If you ever misuse or conflate these concepts later you will be placed in the pillory in Colonial Williamsburg to pay for your statistical crimes. See: http://www.flickr.com/photos/36652543@N06/6046817425/. |
| W<br>10/10 | No class—Washington program trip |
| M<br>10/15 | No class—fall break |

## *5.3 Statistical inference*

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| W<br>10/17 | Population, sample, and sampling distributions<br>• Wooldridge, pp. 747-748 (section C.1 Populations, Parameters, and Random Sampling), and pp. 748-755, focusing in particular on the diagrams (section C.2. Finite Sample Properties of Estimators). |

**Friday, October 19. TAKE-HOME EXAM #1 DUE TO MANNA BY 5PM.**

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| M<br>10/22 | Population, sample, and sampling distributions (cont.)<br>• Wooldridge, pp. 755-759 (section C.3 Asymptotic or Larger Sample Properties of Estimators). The diagram on p. 756 is very important. |

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| W<br>10/24 | Probability revisited: Working with the normal distribution<br>• Wooldridge, pp. 737-741, section on "The Normal Distribution." |
| M<br>10/29 | Confidence intervals and hypothesis testing<br>• Wooldridge, pp. 762-769 (section C.5 Interval Estimation and Confidence Intervals). The paragraph on p. 763 that contains the phrase "…confidence interval is often interpreted as follows…" is very important. |
| W<br>10/31 | Confidence intervals and hypothesis testing (cont.)<br>• Wooldridge, pp. 770-781 (section C.6 Hypothesis Testing). |

**Friday, November 2. HOMEWORK #3 DUE TO BROOKE BY 5PM**

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| M<br>11/5 | Confidence intervals and hypothesis testing (cont.) |
| W<br>11/7 | Inference for means and differences of means<br>• Online Statistics, "Single mean," http://onlinestatbook.com/chapter10/single_mean.html.<br>• Online Statistics, "Difference between two means," http://onlinestatbook.com/chapter10/difference_means.html. |
| M<br>11/12 | Inference for means and differences of means (cont.) |
| W<br>11/14 | Inference for regression<br>• Online Statistics, "Inferential statistics for b and r," http://onlinestatbook.com/chapter12/inferential.html. You can focus on the discussion of the slope rather than the correlation coefficient. |

**Friday, November 16. HOMEWORK #4 DUE TO BROOKE BY 5PM**

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| M<br>11/19 | Inference for regression (cont.) |
| W<br>11/21 | No class—Thanksgiving break |
| M<br>11/26 | Error in hypothesis testing<br>• Online Statistics, "Significance testing," http://onlinestatbook.com/chapter9/significance.html.<br>• Online Statistics, "Type I and Type II errors," http://onlinestatbook.com/chapter9/errors.html. |
| W<br>11/28 | Inference for contingency tables<br>• Online Statistics, "Contingency tables," http://onlinestatbook.com/chapter14/contingency.html. |
| M<br>12/3 | Final paper discussion |
| W<br>12/5 | Multiple regression warmup<br>• Wooldridge, Chapter 2. "The Simple Regression Model," sections 2.1, 2.2, and 2.3.<br>• Wooldridge, Chapter 3. "Multiple Regression Analysis: Estimation," section 3.1. |

**Friday, December 7. TAKE-HOME EXAM #2 DUE TO MANNA BY 5PM.**

**Wednesday, December 19. FINAL PAPER DUE (VIA EMAIL) TO MANNA BY 5PM**