RES-ECON 213
Intermediate Statistics for Business and Economics
FALL 2015
Tuesday and Thursday 2:30-3:45, SOM 133

PROFESSOR
Sylvia Brandt, 205 Stockbridge Hall
Email: brandt@resecon.umass.edu (YOU MUST WRITE RESECON 213 in the subject line. Include your email address.)
Office Hours: Tuesday 10-12 AND by appointment

TEACHING ASSISTANTS
Ben Daubney is the TA for the course and will run the discussion sections on Fridays. He is available for individual help during office hours in Stockbridge 215 on Monday and Wednesdays 12:30 to 3:30. This location may change and we will announce any changes in lecture and on Moodle.

PREREQUISITES
Successful completion of RES-ECON 212 is the ideal prerequisite for the course, because this course uses volume I of the textbook that we will be using and it is directly coordinated with RES-ECON 213. RES-ECON 211 and STATS 240 are acceptable prerequisites. If you have any doubts about your preparedness for this course, please see the instructor as soon as possible.

OBJECTIVES
This is the second course in a two-course sequence for those interested in statistical methods. In the first course (RES-ECON 212) you learned to organize and summarize data, create confidence interval estimates and complete hypothesis tests for a single population. In this course you will learn how to compare different populations through hypothesis testing. You will also learn to estimate relationships among variables through regression analysis.

LEARNING OBJECTIVES
1 Two-Sample Hypothesis Tests
  1.1 Recognize and perform a test for two means with known $\sigma_1$ and $\sigma_2$.
  1.2 Recognize and perform a test for two means with unknown $\sigma_1$ and $\sigma_2$.
  1.3 Recognize paired data and be able to perform a paired $t$ test.
  1.4 Explain the assumptions underlying the two-sample test of means.
  1.5 Perform a test to compare two proportions using $z$.
  1.6 Check whether normality may be assumed for two proportions.
  1.7 Use Excel to find $p$-values for two-sample tests using $z$ or $t$.
  1.8 Carry out a test of two variances using the $F$ distribution.
  1.9 Construct a confidence interval for $\mu_1 - \mu_2$ or $\pi_1 - \pi_2$.

2 Analysis of Variance
  2.1 Use basic ANOVA terminology correctly.
  2.2 Recognize from data format when one-factor ANOVA is appropriate.
  2.3 Interpret sums of squares and calculations in an ANOVA table.
  2.4 Use Excel or other software for ANOVA calculations.
  2.5 Use a table or Excel to find critical values for the $F$ distribution.
  2.6 Explain the assumptions of ANOVA and why they are important.
  2.7 Understand and perform Tukey’s test for paired means.
  2.8 Use Hartley’s test for equal variances in $c$ treatment groups.
  2.9 Recognize from data format when two-factor ANOVA is needed.
  2.10 Interpret main effects and interaction effects in two-factor ANOVA.

3 Simple Regression
  3.1 Calculate and test a correlation coefficient for significance.
  3.2 Fit a simple regression on an Excel scatter plot.
  3.3 Explain the OLS method and use its terminology correctly.
  3.4 Apply the formulas for the slope and intercept.
  3.5 Make and interpret confidence intervals for regression coefficients.
  3.6 Test hypotheses about the slope and intercept by using $t$ tests.
3.7 Perform regression with Excel or other software.
3.8 Interpret the standard error, $R^2$, ANOVA table, and $F$ test.
3.9 Distinguish between confidence and prediction intervals.
3.10 Test residuals for violations of regression assumptions.
3.11 Identify unusual residuals and high-leverage observations.
3.12 Explain the role of data conditioning and data transformations.

4 Multivariate Regression
4.1 Use a fitted multiple regression equation to make predictions.
4.2 Interpret the $R^2$ and perform an $F$ test for overall significance.
4.3 Test individual predictors for significance.
4.4 Interpret confidence intervals for regression coefficients.
4.5 Incorporate a categorical variable into a multiple regression model.
4.6 Detect multicollinearity and assess its effects.
4.7 Analyze residuals to check for violations of residual assumptions.

REQUIRED MATERIALS


COURSE SCHEDULE
We will quickly review chapters 8 and 9, which are prerequisites to this course. We will then cover chapters 10 – 12 in depth. We will cover the main ideas of chapter 13 briefly. We will spend approximately the first 7 lectures reviewing chapters 8 and 9. Each subsequent chapter will take 6 – 8 lectures. Lecture notes will be posted after that day’s lecture on Moodle. Those notes will include a list of term and concepts that we covered that day as well as homework problems. Those problems will be reviewed at the Friday discussion sections.

GRADING

<table>
<thead>
<tr>
<th></th>
<th>Weight</th>
<th>Schedule</th>
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<tbody>
<tr>
<td>MOODLE ASSIGNMENTS</td>
<td>10%</td>
<td>January 27, February 19, March 26, April 2, April 16. Responses graded on a 0-5 scale.</td>
</tr>
<tr>
<td>IN-CLASS QUIZES</td>
<td>10%</td>
<td>January 29, February 5, February 26, March 5, March 12, April 9, April 23. Responses graded on a 0-5 scale. I keep your top 5 scores. There are no make-ups for missed in-class quizzes.</td>
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<tr>
<td>EXAM 1</td>
<td>25%</td>
<td>February 12, in class.</td>
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<tr>
<td>EXAM 2</td>
<td>25%</td>
<td>March 31, in class.</td>
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<tr>
<td>FINAL EXAM</td>
<td>30%</td>
<td>To be scheduled by the registrar.</td>
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<td>Extra credit</td>
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<td>Written summaries must be turned in by April 16.</td>
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The following is the minimum grade cutoff points based on a percentage of the total points available:
A = 92, A- = 90, B+ = 86, B = 82 B- = 78, C+ = 74, C = 70, C- = 66, D+ = 62, D = 58 and F<58

Extra Credit
You can earn up to 15 extra credit points that would be added to your total accumulated points. There are two ways to earn these points.

1. Attend a seminar on a topic of your interest that has a quantitative component. To earn the extra credit you will write a three-paragraph summary of the seminar. Your summary should include a brief description of the topic, the statistical issues at play and your assessment in terms of what you learned and what questions remain for you.
2. Find a podcast that uses statistics in its analysis. To earn the extra credit you will write a five question multiple choice quiz on the statistical issues.
POLICIES

Please no mobile phones, PDAs or laptops during class. **Students are expected to come to class AND participate. I expect academic honesty from all students.** Please see the university statement below.

Please do not fall behind. I am always happy to meet to answer questions to clarify material, but it is your responsibility to contact me.

ACADEMIC HONESTY

All members of the University community must participate in the development of a climate conducive to academic honesty. While the faculty, because of their unique role in the educational process, have the responsibility for defining, encouraging, fostering, and upholding the ethic of academic honesty, students have the responsibility of conforming in all respects to that ethic.

Intellectual honesty requires that students demonstrate their own learning during examinations and other academic exercises, and that other sources of information or knowledge be appropriately credited. Scholarship depends upon the reliability of information and reference in the work of others. No form of cheating, plagiarism, fabrication, or facilitating of dishonesty will be condoned in the University community.

Academic dishonesty includes but is not limited to:

**Cheating** - intentional use, and/or attempted use of trickery, artifice, deception, breach of confidence, fraud and/or misrepresentation of one’s academic work.

**Fabrication** - intentional and unauthorized falsification and/or invention of any information or citation in any academic exercise.

**Plagiarism** - knowingly representing the words or ideas of another as one’s own work in any academic exercise. This includes submitting without citation, in whole or in part, prewritten term papers of another or the research of another, including but not limited to commercial vendors who sell or distribute such materials.

**Facilitating dishonesty** - knowingly helping or attempting to help another commit an act of academic dishonesty, including substituting for another in an examination, or allowing others to represent as their own one’s papers, reports, or academic works.

Sanctions may be imposed on any student who has committed an act of academic dishonesty.

Any person who has reason to believe that a student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor as soon as possible.

Formal definitions of academic dishonesty, examples of various forms of dishonesty, and the procedures which faculty must follow to penalize dishonesty are contained in *The Code of Student Conduct*, a publication of the Dean of Student Affairs. A student accused by an instructor or another student of having committed a breach of the academic honesty regulations has the right to appeal before any penalty can be imposed. Appeals must be filed within ten days of notification by the instructor that s/he suspects dishonesty. Information on the appeals process is also contained in *The Code of Student Conduct*, or can be obtained from the Ombuds Office, where appeals are filed.