Computer Projects

There are five projects to be completed and graded. With each project, make a presentation in *Excel* describing the project and its conclusions. Each project should demonstrate use of the concepts developed in the course. Creative choice of topic will yield a better grade. The quality of presentation matters, simple and elegant is best. Comment on related literature. Your submission should be authoritative with text describing the methods used and conclusions drawn. Submit an *Excel* file electronically in your section's digital drop box on OAK [www.vanderbilt.edu/OAK (then choose Blackboard)] to your section leader.

Each team may plan projects jointly and gather data together. Each member of the team should use his or her own variables and prepare his or her own report for Projects B, D, and E. Do not copy any part of someone else's project. Originality matters. The Honor Code applies.

See the gallery on OAK for examples of projects from prior semesters. Note that the project assignments differ from term to term and projects in the Gallery aren't perfect.

Project A Descriptive Statistics Sept 10 for team grade

For Project A, each team will prepare a single report and submit it jointly for a common grade.

Develop some original data (not published). Make a relative frequency polygon and compute descriptive statistics for at least two (to make an interesting comparison) random variables with 18 or more observations for each. Make clear the method used to generate the sample used. The contrast between two groups is the usual basis of drawing conclusions.

Examples: Go to two car dealerships and collect data on the sticker prices of cars.
Use the Internet to find prices of comparable products from two sources.
Survey students about Internet purchases. Compare male and female or first year and fourth year students.

Project B: Probability Exploration Oct 5 individual

Use one of the PDFs in chapter 7 to explore a phenomenon you observe. Make observations, plot a relative frequency polygon, and compute descriptive statistics to define values for needed parameters of the PDF. Use *Excel* to generate a table of probabilities for the phenomenon and plot them on the same chart as the relative frequency polygon. Then, write a description of the phenomena and, using probability statements, make forecasts about the phenomenon. Observing something that might be a Poisson process is easiest. Observing something that might follow one of the other PDFs offers more challenge.

Example: Observe how many people enter the Bookstore during each minute at some interval in the day. Use the Poisson distribution with the appropriate lambda you have estimated to define a specific probability distribution for entrance per minute. Create a table of probability values for that PDF. Make probability statements about entrance per minute at the Bookstore assuming that your parameter values are correct.

Project C Monte Carlo Study Oct 19 team grade

For Project C, each team will prepare a single report and submit it jointly for a common grade.

This project asks that you simulate data along the lines discussed in chapter 11. The chapter contains a number of examples. Pick a distribution and generate a population of 3,100 values. Treat the population as though it were unknown. You are to explore how the mean of sample means relates to the population. For more challenge, you may compare the distribution of the sample mean to the distribution of other sample statistics.

Draw M, say 100, random samples of size n (say 30) from the population using the procedure described in chapter 11. Compute the value of the sample mean for each sample. Finally, observe the pattern of the sample mean over the several samples from the same population. What is the mean of the distribution of the sample means? What is the standard deviation of the sample mean over the several samples? What mean and standard deviation do you expect? Plot a frequency polygon for the sample means. Repeat the whole process with a different sample size, say, a much larger sample. How does the distribution of the sample mean differ?

Compare your results for the sample mean with that predicted by the Central Limit Theorem. Your summary paragraphs interpreting your simulation exercise are important.

The description above makes a basic project. Chapter 11 presents a variety of ideas for deeper exploration. Better projects use simulations to explore bias and efficiency in sample statistics.

Project D Hypothesis Test & Bootstrap Nov 9 individual

Use published data either from the Internet or a printed source to test a hypothesis that compares two or more means, proportions, or variances. Apply methods discussed in chapters 13 to 16. Better projects will explore hypotheses with economic content, for example, comparing a distribution of prices or incomes. Give complete citations to sources so that your reader can replicate your study. Use the latest available data. Use a conventional hypothesis testing method, test the same hypothesis with a bootstrap method, and compare the two results. Include a plot of the relative frequency polygon of the resampled statistic to show its distribution.

Examples: Is the mean price of ski slope daily lift tickets higher on slopes east of the Mississippi River?.
Has the mean rate of growth of per capita GDP been higher in coastal versus landlocked countries?

Project E Regression (counts double) Dec 10 individual

Investigate the relationship between two or more random variables using regression. Use original or published data about variables that you expect to be related to one another. Formulate and test appropriate hypotheses. Plot a scatter diagram of the residuals and discuss their pattern, making adjustments for heteroscedasticity where appropriate.

Better projects reflect deeper knowledge of the hypotheses tested. Projects will look for curvature in partial correlation plots and make suitable adjustments in the model. Chow tests will enrich some projects. Let the discussion justify the hypotheses investigated and consider the implications of the findings.

Examples of Project E:
Regress GDP per capita over many countries on attributes of the countries. Are landlocked countries poorer, other things equal?
Use a guide to colleges and regress tuition on attributes of colleges.

Project Critique

Name of Project Author: _____ Name of Project Critic: _____

1. Does the project fulfill the basic requirements with goals, methods, and conclusions?

2. Does the accompanying text report describe the projects goals, literature, methods, and conclusions clearly?

3. Are the statistics used appropriately and explained clearly? Are sources noted?

4. Is the presentation polished in terms of graphics and text enough to show in a job interview?

5. Does the project go beyond basic requirements in originality of topic, statistical method, and insightful conclusions?

6. On a scale of one (inadequate) to five (meets basic requirements only) to seven (meets the requirement and is well presented) to ten (this is so interesting, I'd like to show it to my parents), what score will you give it?

Report on Team

Each member of the class should submit a report each month by email to the section leader on the extent of team effort. Here are questions to be addressed.

1. Who are the members of the team?
2. How often did the team meet, how many hours all together?
3. How helpful was the team on the projects this month?
4. How helpful was the team in preparing for tests?
5. How helpful was each member of the team?
6. How much did you contribute to the team effort?
7. How might the team improve its success?
8. On a scale of ten (the team taught me all) to one (team is dysfunctional), score the team.