STATISTICS FOR ENGINEERS
ASSIGNMENT 13
NOVEMBER 29, 2010

This homework assignment deals with problems from all previous chapters. Please make sure you read the questions thoroughly and think about them before you begin your answer. Some of these questions use a real data set; you will need to use a data analysis program. At this point, Excel is still usable. The solutions I will post, however, will use `R`. Download the data from the web site. The filename is `sri2010.csv`. When you download the dataset, remember to right click and save it as a `csv` file.

The data are the results from the 2010 Sri Lankan presidential election. Sri Lanka is divided into provinces, districts, and electoral divisions. These roughly correspond to states, counties, and precincts in the United States. This election pitted incumbent president Mahinda Rajapaksa against challenger Sarath Fonseka. The data contains the percent of the vote for Rajapaksa (`pRajapaksa`), the percent of the vote for Fonseka (`pFonseka`), the percent of the vote that was rejected (`pRejected`), and the voting turnout (`pVoting`) in each of the electoral divisions.

Do not forget. Unless stated otherwise, $\alpha = 0.05$. Also, problems 13.1 through 13.3 are worth 3 points each; 13.4, 4 points.

Finally, this assignment needs to be typed in a nice format, with a discussion for each problem. Each answer should be a paragraph in length (a few sentences) and should specify your null hypothesis, your test(s), the tests statistic(s), the degrees of freedom, and the p-value(s). When you hand in this assignment, attach your work to the back of the typed pages. That way, if your numbers are different from mine, I may be able to determine what you did wrong. To see the format for the written answers, please see Homework 12.

Good luck!

Problem 13.1

This first problem has you compare the turnout in Northern Province with the turnout in Sabaragamuwa Province. What is the (sample) mean turnout for each of the two provinces? What is the (sample) variance of the turnout in each? Are the (population) variances the same in the two provinces? Are the (population) means the same?

Problem 13.2

This problem has you compare the percent of rejected votes in Northern Province with the percent of rejected votes in Sabaragamuwa Province. What is the (sample) mean percent rejected votes for each of the two provinces? What is the (sample) variance of the percent rejected votes in each? Are the (population) variances the same in the two provinces? Are the (population) means the same?

Problem 13.3

This problem wants to examine the distribution of rejected votes in the election. Note that a province is won by a candidate if the candidate has the most votes in that province. Which provinces were won by Rajapaksa? Which were won by Fonseka? Was the proportion of rejected votes (at the electoral division level) significantly lower in those provinces won by the challenger (Fonseka)? To answer this, state the null hypothesis, the mean proportion of rejected votes in each group (province voted for Rajapaksa; province voted for Fonseka), the variance of that proportion, whether the population variances are equal (at the usual α level), and the results from the means test you used. Make sure you cite the correct values (test statistic value, degrees of freedom, and p-value).

Problem 13.4

This problem asks you to determine if there is a relationship between the proportion of rejected votes and the proportion of votes for Rajapaksa. Think: In a fair election, should there be a statistically significant relationship between these two variables? To answer this

question, first do a scatterplot with proportion of rejected votes as the y-variable and with proportion of votes for Rajapaksa as the x-variable. Please label your axes appropriately.

Next, find the variances of the proportion rejected votes and of the proportion support for Rajapaksa. Find the covariance between these two variables. Find the correlation between the two variables and determine if this correlation is statistically significant.