Homework 1 Assignment

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Amazon Reviews

The dataset consists of 13 319 reviews for selected products on Amazon from Jan-Oct 2012. Reviews include product information, ratings, and a plain text review.

We will look for words associated with good/bad ratings.

The data consists of three tables:

##Review subset.csv is a table containing, for each review, its

- ProductId: Amazon ASIN product code
- UserId: ID of the reviewer
- Score: numeric 1-5 (the number of stars)
- Time: date of the review
- Summary: review summary in words
- Nrev: number of reviews by the user
- Length: number of words in the review
- Prod Category: Amazon product category
- Prod Group: Amazon product group

Word freq.csv

is a simple triplet matrix of word counts from the review text including

- Review ID: the row index of Review subset.csv
- Word ID: the row index of words.csv
- Times Word: how many times the word occurred in the review

Words.csv

contains 1125 alphabetically ordered words that occur in the reviews.

Data exploration

The code below loads the data.

Marginal Regression Screening

We would like to pre-screen words that associate with ratings. To this end, we run a series of (independent) marginal regressions of review Score on word presence in review text for each of 1125 words.

In the starter script below, you will find a code to run these marginal regressions (both in parallel and sequentially). The code gives you a set of p-values for a marginal effect of each word. That is, we fit

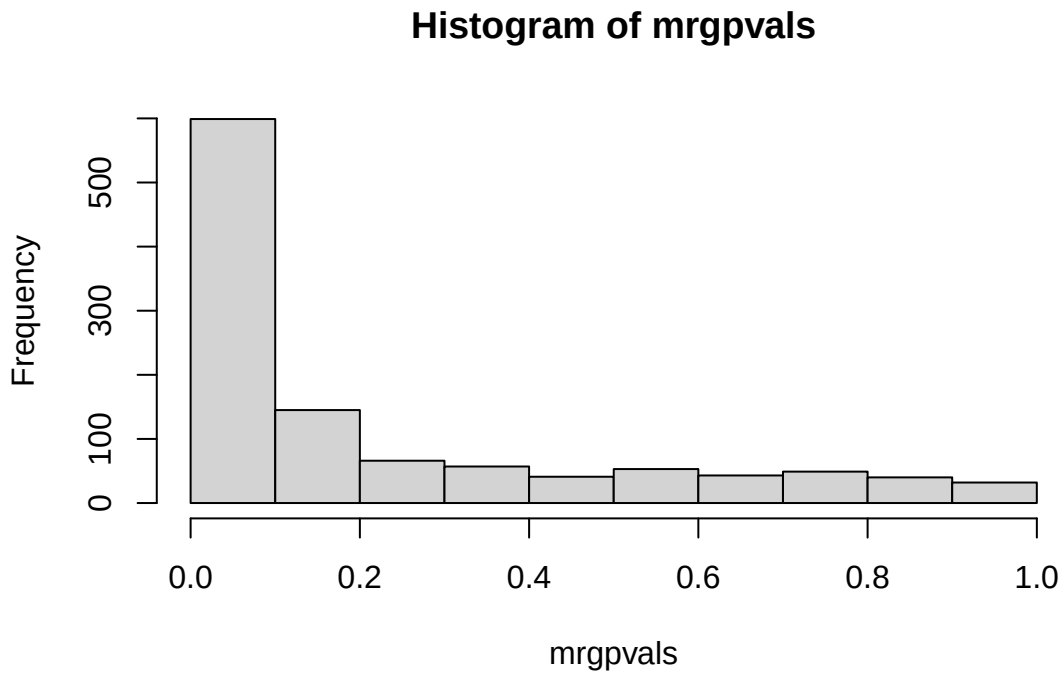
$$\texttt{stars}_i = \alpha + \beta_j I[x_{ji} > 0] + \epsilon_{ji}$$

for each word term j with count x_{ji} in review i, and return the p-value associated with a test of $\beta_j \neq 0$. We'll use these 1125 independent regressions to screen words.

Homework Questions:

(1) Plot the p-values from the marginal screening and comment on their distribution. (10 point)

By plotting a histogram of the p-values from the marginal screening, we can see the distribution of the p-values is heavily right skewed.

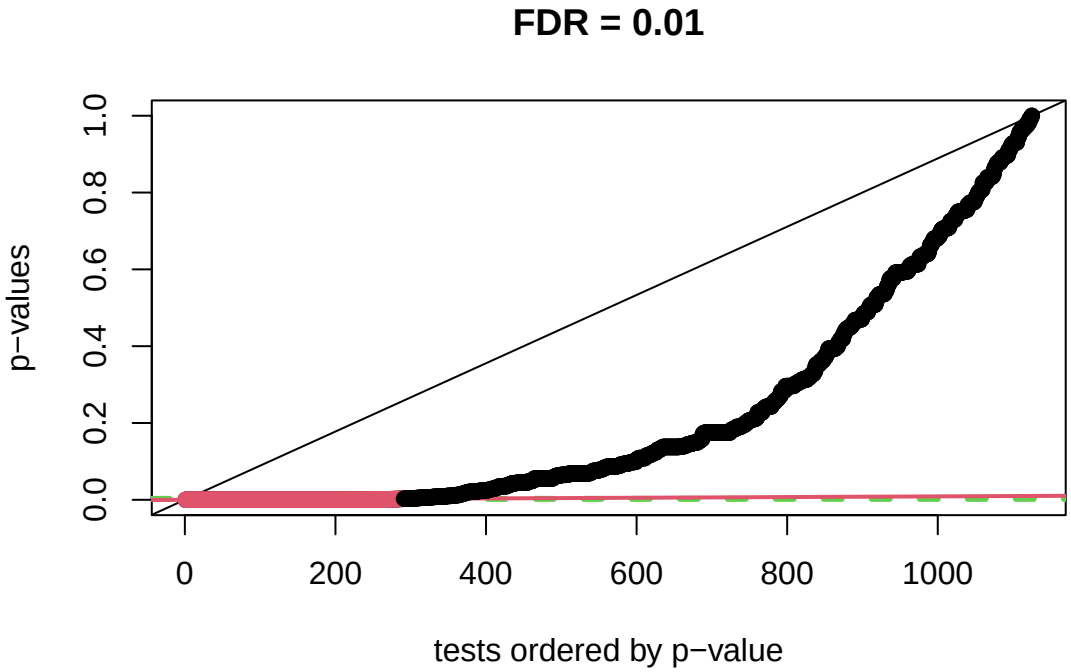


(2) Let's do standard statistical testing. How many tests are significant at the alpha level 0.05 and 0.01? (10 point)

The marginal p-values are already the p-values for t-tests of the predictor in each marginal regression. At alpha = .05, we have 461 significant tests. At alpha =.01 we have 348 significant tests.

(3) What is the p-value cutoff for 1% FDR? Plot and describe the rejection region. (10 point)

The p-value cutoff for 1% FDR is .002413249. The rejection region is visible in the plot and encompasses the points in red. This area is defined by a cutoff for the p-value that is found using the set FDR of 1% for conducting multiple tests. The false discovery rate, or number of tests that return a false positive is controlled and a region of p-values is identified where the null hypothesis is rejected. ##is this ok?



(4) How many discoveries do you find at q=0.01 and how many do you expect to be false? (10 point)

At q=.01, there are 290 discoveries. We expect 2.9, or approximately 3 since the number of tests is an integer, of those discoveries to be false.

(5) What are the 10 most significant words? Do these results make sense to you? What are the advantages and disadvantages of our FDR anaysis? (10 point)

The 10 most significant words were: not, horrible, great, bad, nasty, disappointed, new, but,same, poor. Many of these words are direct expressions of a reviewer's sentiment about the product and so make sense as being significant such as "disappointed" or "great". However, there are a few significant words such as "not", "but" and "same" which are less obviously indicative of product rating. It is possible that these words frequently co-occur with other more meaningful words, which could explain the significance. This is a potential disadvantage of the FDR analysis, because we are not considering additive or interactive effect that words might have together. An advantage of the FDR analysis though is that it allows us to limit how many results that are considered significant are false positives. ##Need to potentially discuss more advantage/disadvantage