Multiple Test Taking

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Introduction

The SAT is one of the exams that are used as an entrance criterion by many US universities. The Chronicle of Higher Education (2003, January 29) summarized an article on the American Prospect website entitled "College Try: Why Universities Should Avoid Allowing Applicants to Take the SATs Over and Over Again." This article argues that existing college admission policies encourage applicants to take the SAT exam several times and only use the highest score for admission cons Two alternatives are proposed by the author that he feels would be fairer than using the highest score. The following are:

- Alternative 1: Use the average of all test scores
- Alternative 2: Use only the most recent score

In this activity, by looking at the sampling distributions of three figures for the cases of a test taker taking the exam twice and a test taker taking the exam five times, you can examine the discrepancies between the three possibilities:

- max = maximum score
- mean = average score
- recent = most recent score

Scenario

The scores of a person on the SAT test will fluctuate between test administrations. Suppose that the 'actual skill' of a given student is expressed by a SAT score of 1200, but due to chance fluctuations, the test score can be called a random variable with a distribution that is roughly average with a mean of 1200 and a standard deviation of 30 due to chance fluctuations. If we pick a sample from this normal distribution, it is possible to consider the resulting series of observations as a series of test scores that this subject would have received.

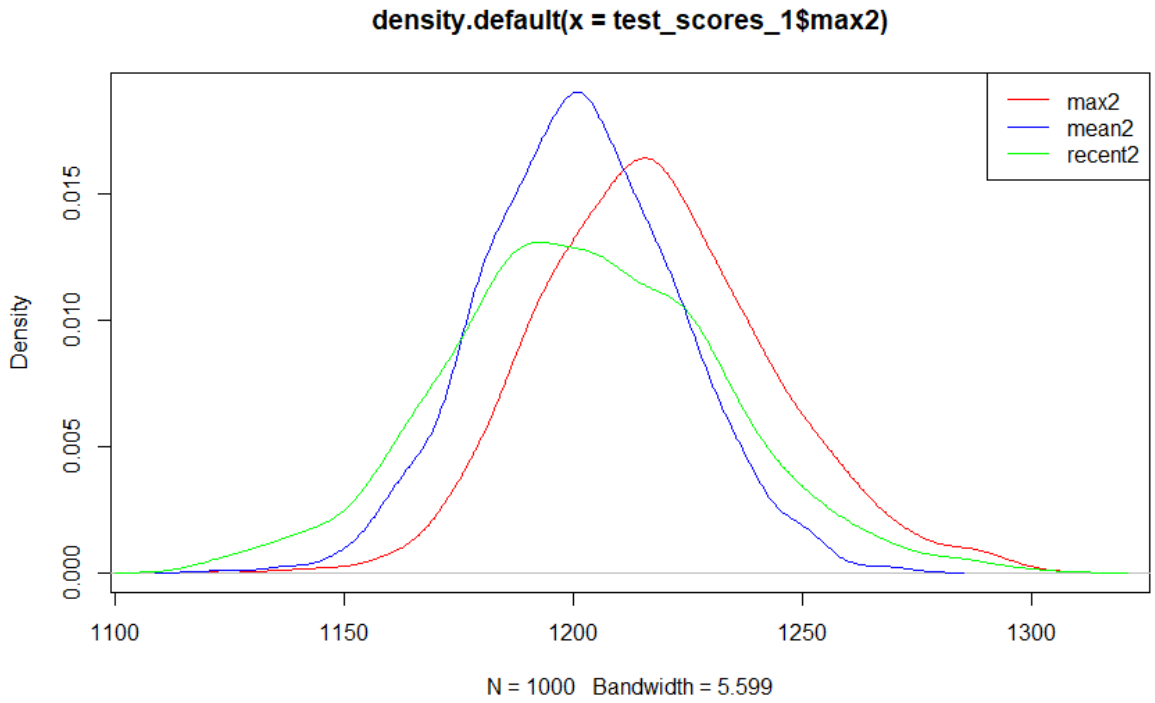
Requirements

Part I

In the first part, we will simulate the two test scores for 1000 SAT test-takers. Using the R programming language, we will generate the 1000 tests with a mean of 1200 and a standard deviation of 30. Then we will calculate the test score average, maximum, and the recent for each test taker. Lastly, visualize the density chart for each of them in one graph.

Figure 1

density graph of max, mean, and recent scores for dataframe one



The code of part one will display in the following figure 2. Codes inline 2 and 3 are to create 1000 observations of test-takers with a mean of 1200 and a standard deviation of 30. Code inline 5 is to create a data frame contain two variables score1 and score2 that have the values in s1 and s2 that created in lines 2 and 3. In line 7, a new variable (max2) created using the mutate() function of dplyr library and pmax() method of mutate() to assign the maximum value of each test taker had. In line 8, a new variable as mean2 created to assign the averages of test scores of each test taker. In line 9, a new variable as recent2 has the recent scores of each test taker. In line 11, code to plot the density of maximum, mean, and recent test scores of each test taker that in figure 1.

Figure 2

script code of part one

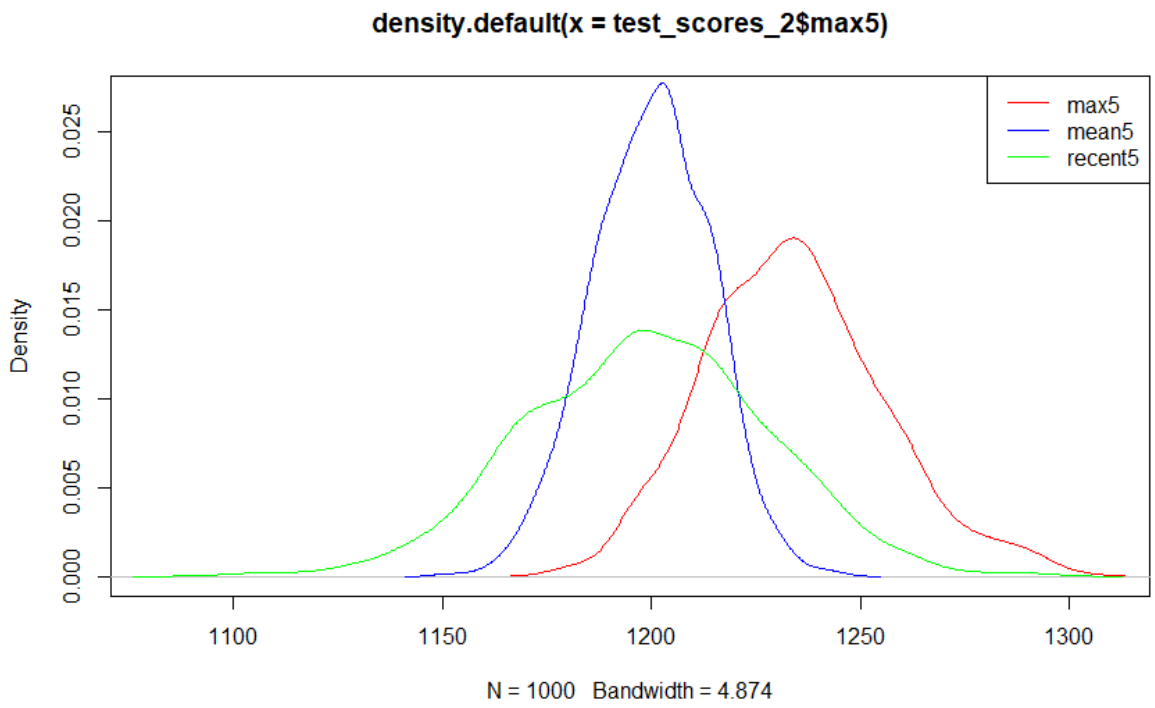
```
1  # create the five scores
2  s1 = rnorm(n=1000,mean = 1200, sd = 30)
3  s2 = rnorm(n=1000,mean = 1200, sd = 30)
4  # create test scores dataframes
5  test_scores_1 <- data.frame('score1'= s1,'socre2'= s2)
6  # create max, mean and recent scores for each observation for both dataframes
7  test_scores_1 <- test_scores_1 %>% mutate( max2 = pmax(test_scores_1$score1,test_scores_1$socre2))
8  test_scores_1 <- test_scores_1 %>% mutate( mean2 = (test_scores_1$score1 + test_scores_1$socre2)/2)
9  test_scores_1 <- test_scores_1 %>% mutate(recent2 = test_scores_1$socre2)
10 # max= red, mean= blue, recent= green
11 plot(density(test_scores_1$max2),ylim= c(0.0,0.019), col='red')+
12   lines(density(test_scores_1$mean2),col='blue')+
13   lines(density(test_scores_1$recent2),col='green')+
14   legend('topright',legend = c('max2','mean2','recent2'),col = c('red','blue','green'),lty = 1)
```

Part II

In the second part, the process is similar to part one but with five test scores variables. In figure 3, shows the density of max, mean, and recent scores of each test taker.

Figure 3

density graph of max, mean, and recent scores for dataframe two



The code of part two in figure 4, codes in lines 2 through 6 is two create 1000 observations with a mean of 1200 and a standard deviation of 30. The code in line 8 is to create the dataframe of these five test scores. Code In lines 10 and 11 is to generate the new column for the maximum of test scores for each test taker. Code in lines 12 and 13 is to

generate a new column as mean5 for the average of each test-takers. The following code in line 14 is to has a recent score of the five test scores. The last code in lines 16 and 17 is to display the density of the max, mean, and recent test scores in one graph.

Figure 4

script code of part two

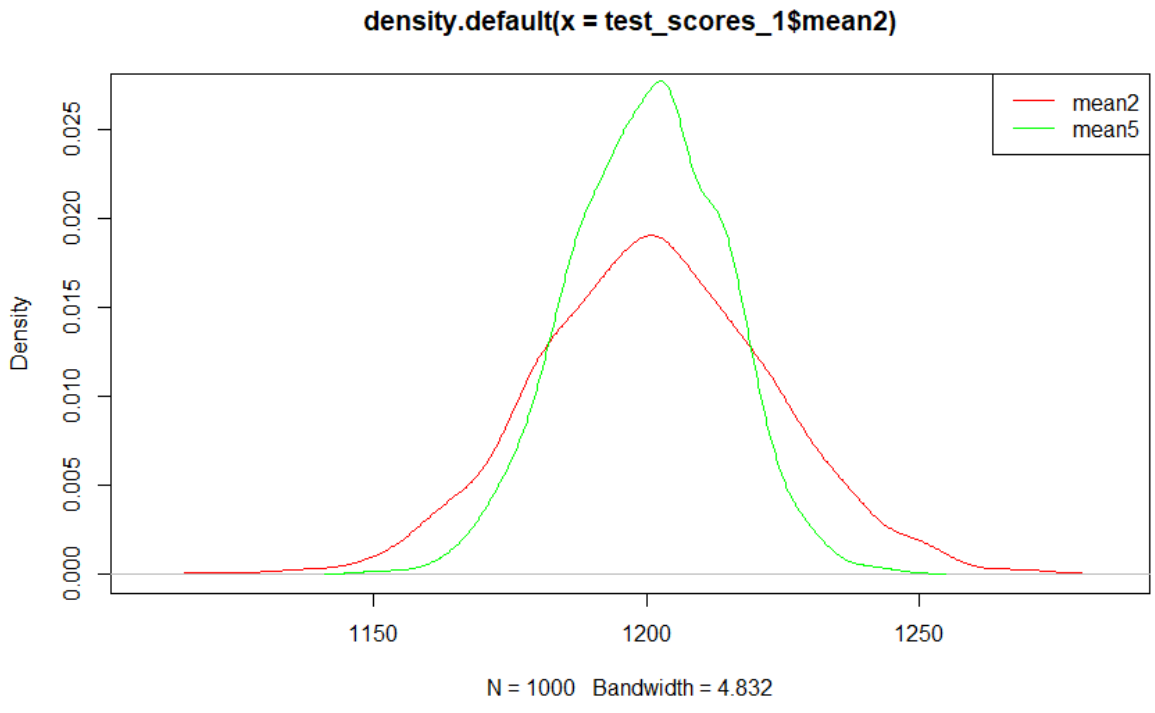
```
1  # create the five scores
2  s1 = rnorm(n=1000,mean = 1200, sd = 30)
3  s2 = rnorm(n=1000,mean = 1200, sd = 30)
4  s3 = rnorm(n=1000,mean = 1200, sd = 30)
5  s4 = rnorm(n=1000,mean = 1200, sd = 30)
6  s5 = rnorm(n=1000,mean = 1200, sd = 30)
7  # create test scores dataframes
8  test_scores_2 <- data.frame('score1'= s1, 'score2'=s2, 'socre3'=s3, 'score4'=s4, 'score5'=s5)
9  # create max, mean and recent scores for each observation for both dataframes
10 test_scores_2 <- test_scores_2 %>% mutate( max5 = pmax(test_scores_2$score1,test_scores_2$score2,
11                                                       test_scores_2$socre3,test_scores_2$score4,test_scores_2$score5))
12 test_scores_2 <- test_scores_2 %>% mutate( mean5 = (test_scores_2$score1+test_scores_2$score2+
13                                                    test_scores_2$socre3+test_scores_2$score4+test_scores_2$score5)/5)
14 test_scores_2 <- test_scores_2 %>% mutate( recent5 = test_scores_2$score5)
15 # max= red, mean= blue, recent= green
16 plot(density(test_scores_2$max5),ylim= c(0.0,0.027),xlim=c(1080,1310), col='red')+
17   lines(density(test_scores_2$mean5),col='blue')+lines(density(test_scores_2$recent5),col='green')+
18   legend('topright',legend = c('max5','mean5','recent5'),col = c('red','blue','green'),lty = 1)
```

Part III

Sampling distribution of mean2 and mean5 in both tests indicate that more testing test takers they do, grades became close to 1200 mark as we can see in figure 5.

Figure 5

density of mean2 and mean5

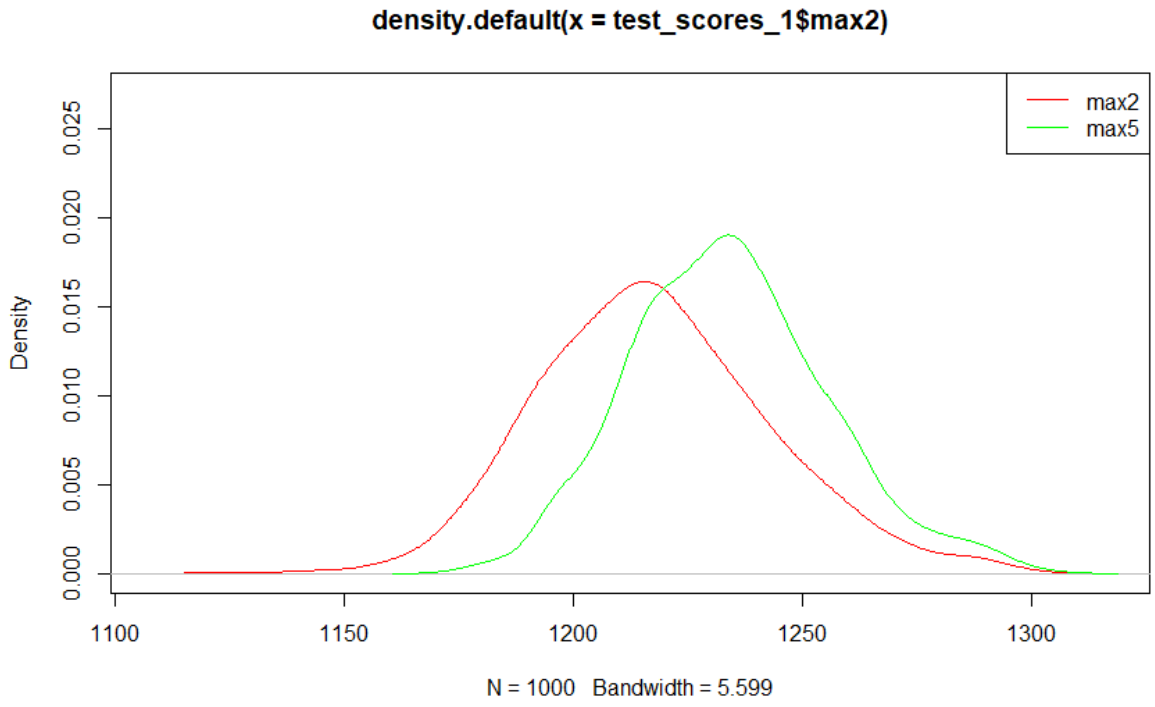


The three distributions in Part I, which shows the density of maximum, mean, and recent test scores. The maximum score advantages are clearly shown in the figure 1 graph. The peak of maximum test scores in the right side, that means most grades between 1200 and 1250; we can say about 1225 score. On the other hand, the peaks of mean and recent are equal or below grade 1200.

The maximum sampling distribution between two test-takers and five test takers the benefit goes to the five test-takers. The two peaks in figure 6 show that the grades of five test-takers close to 1240 grade and lowest scores neat to the peak of the two test takers, So, in doing the test more, the grade goes to be higher. Which is a big advantage from those taking only two test-takers.

Figure 6

density of max2 and max5



The author proposed two alternatives, one of them is to take a recent score which is not good as shown in both density graphs in figures 1 and 3. The peak is the lowest and the

most speared scores. The second alternative taking the mean is good but if the test takers take the test twice, not five times. Because the mean and maximum scores tend to be close to each other, but with five-time test-takers way better than the mean score. So, it is recommended to limit the times that test-takers can take the SAT exam, two times to annihilate the favor of the rich student and take the maximum test score which is realistic than taking the average, a human can develop him/her self to be better; it not realistic to gauge anyone in the past or what is the benefit of human improve themself! So, the maximum score more realistic to choose from.

References

Field, A. P., Miles, J., & Field, Z. (2014). *Discovering statistics using R*. London, UK: Sage.