HW4_SDS315

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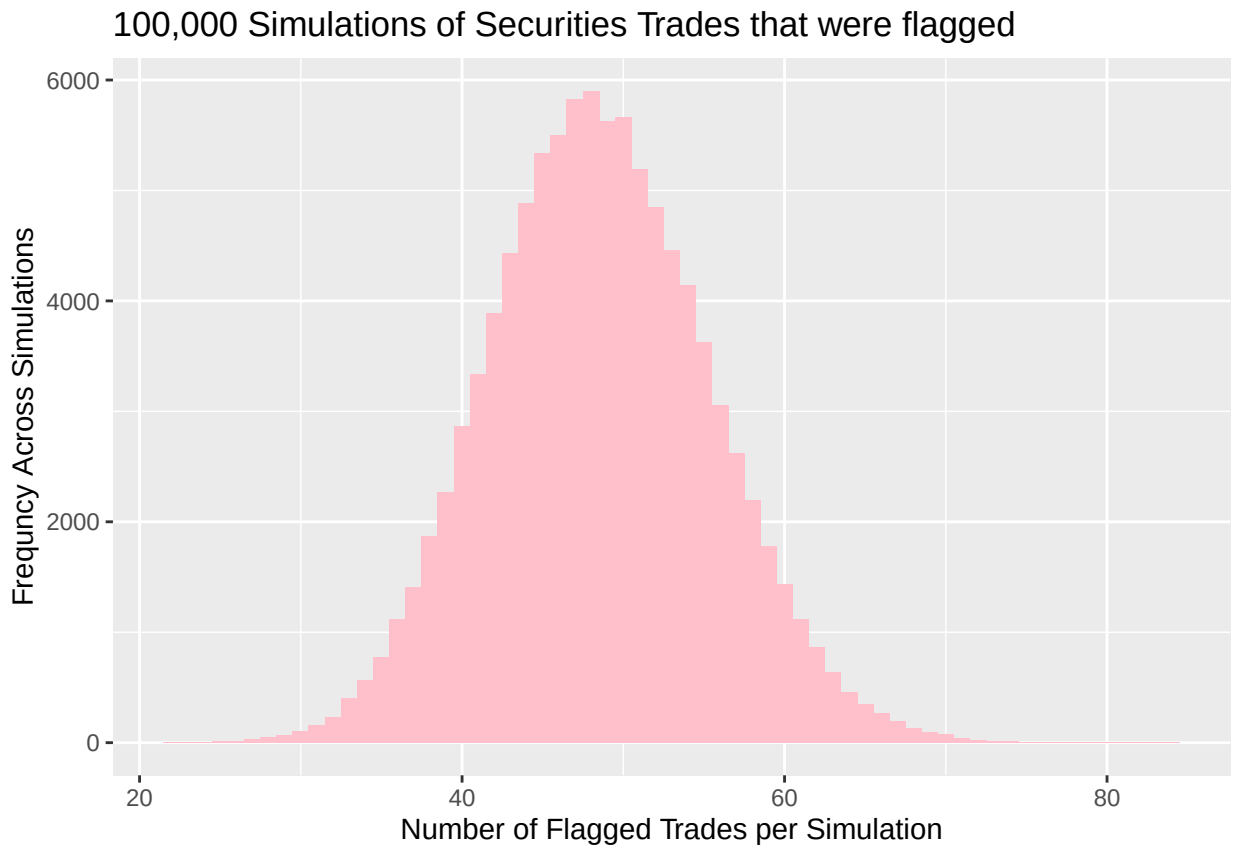
Problem 1: Iron Bank

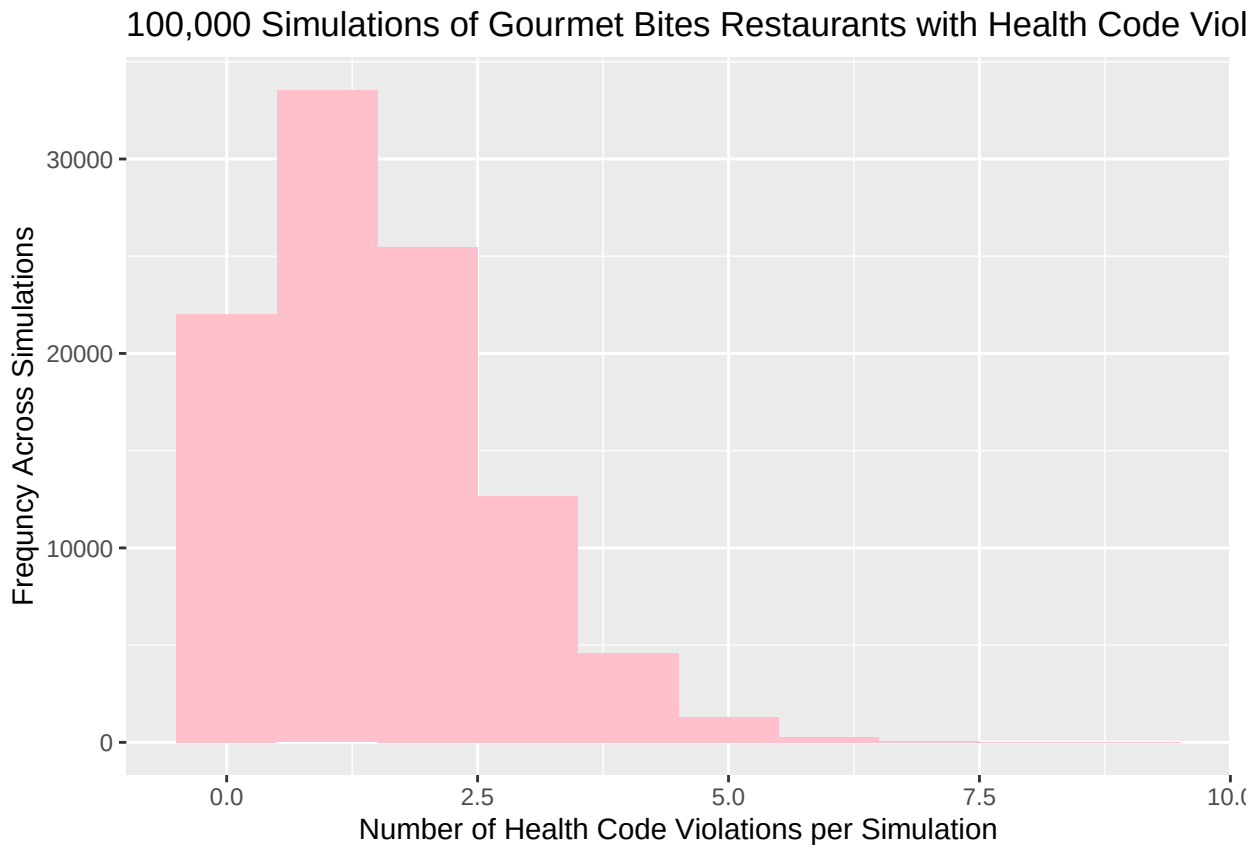
```
## [1] 0.00187
```



My null hypotheses is that the probability of security trades from the Iron Bank being flagged is 2.4%. The alternate hypothesis is that this probability is greater than 2.4%. The test statistic the 70 out of 2021 trades that were flagged. The p-value is 0.002. Because the p-value very low, we reject the null hypothesis. This means that there is significant evidence that the probability of security trades from the Iron Bank is above 2.4%.

Problem 2: Health Inspections

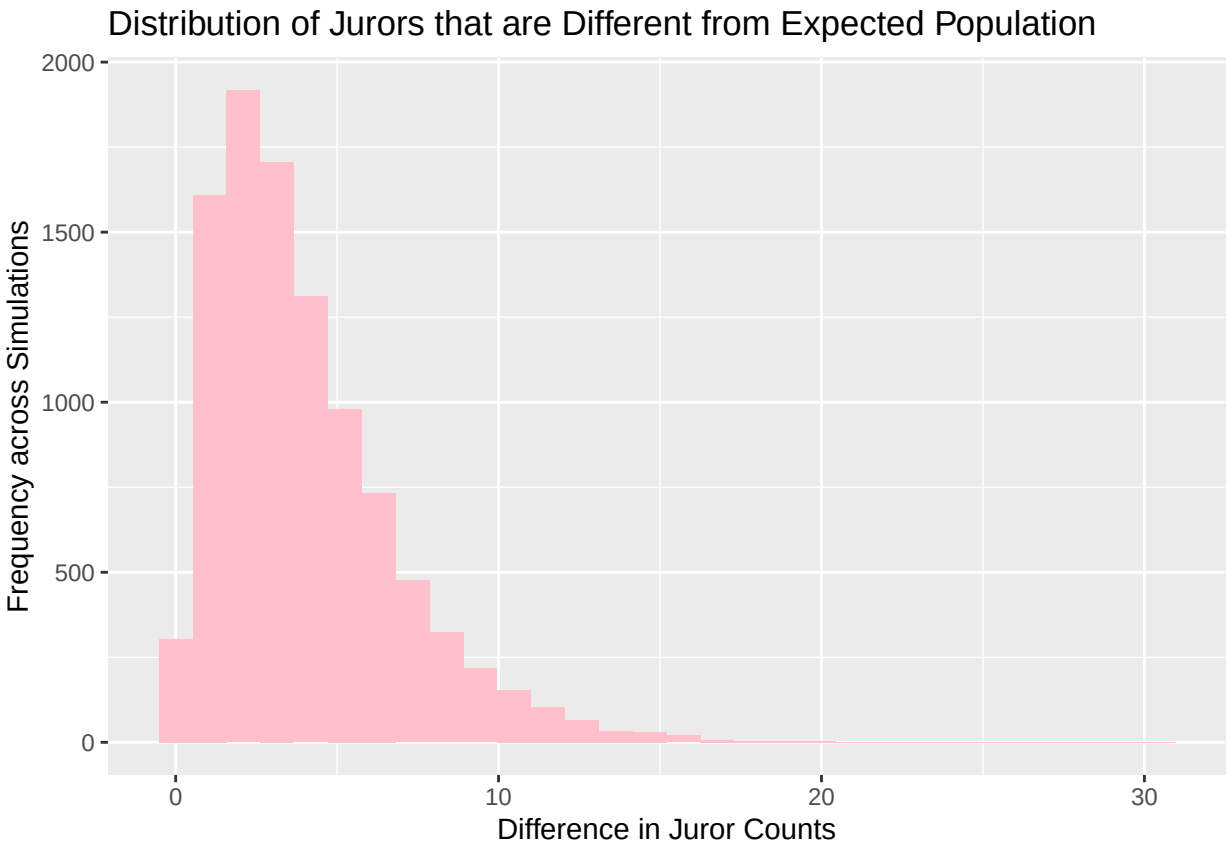
```
## [1] 0.00011
```



My null hypotheses is that on average, restaurants in the city are cited for health code violations at the same 3% baseline rate. The alternative hypothesis is that the probability is higher than 3%. The test statistic the 8 out of 50 health code violations. The p-value is 0.0001. Because the p-value very low, we reject the null hypothesis. This means that there is significant evidence that the probability of getting 8 out of 50 health violations is unlikely since it is unlikely to happen purely by chance.

Problem 3: Evaluating Jury Selection for Bias

```
##   count(chi2 >= 12.42639)/n()
## 1                      0.0139
```



The null hypothesis is that the jurors selected by the judges match the distribution of the county's juror distribution. The alternative hypothesis is that the distribution does not match. The test statistic is the chi-squared test because we are comparing observed and expected. The p-value is 0.0136. Since it is small, we reject the null hypothesis. There is enough evidence to claim that the jurors selected by the judge differs significantly from the county's distribution of jurors. This suggests systematic bias in jury selection. Another explanation could be that some jurors of certain groups were unavailable, leading to an increase in the number of jurors in other groups. To investigate further, I could increase the sample size to reduce variability. I could also do many simulations.

Problem 4: LLM Watermarking

Part A

Part B

```
## # A tibble: 10 x 2
##    Sentence                                                        P_Value
##    <chr>                                                             <dbl>
##  1 She opened the book and started to read the first chapter, eagerly a~   0.513
##  2 Despite the heavy rain, they decided to go for a long walk in the pa~   0.926
##  3 The museum's new exhibit features ancient artifacts from various civ~   0.076
##  4 He carefully examined the document, looking for any clues that might~   0.489
##  5 The students gathered in the auditorium to listen to the guest speak~   0.484
##  6 Feeling vexed after an arduous and zany day at work, she hoped for a~   0.009
```

```
##  7 The chef demonstrated how to prepare a delicious meal using only loc~   0.328
##  8 They watched the sunset from the hilltop, marveling at the beautiful~   0.988
##  9 The committee reviewed the proposal and provided many points of usef~   0.084
## 10 Despite the challenges faced during the project, the team worked tir~   0.059
```

The null hypothesis is that the letter distribution in the sentences follows the letter distribution of the English language. The alternative hypothesis is that the distribution does not follow the English language. The chi-squared statistic is our test statistic. All of the sentences have a fairly large p-value except for the p-value of 0.009. This sentence was, "Feeling vexed after an arduous and zany day at work, she hoped for a peaceful and quiet evening at home, cozying up after a quick dinner with some TV, or maybe a book on her upcoming visit to Auckland." This suggests that there is significant evidence that this came from AI.