### Problem 1

The simulation returned an average value for which is closest to 0.01 Thus the answer is B

### Problem 2

Only coin selections that don’t take the results of the flips into consideration satisfy the Hoeffding inequality. Since is chosen pseudo randomly we know that this is exactly the application of hoeffding. Since is practically random, meaning that it is only being chosen because it is the first sequentially and it could just as well be any other sampled coin. Thus Hoeffding applies to and . It does not apply to because we explicitly chose it because it is the coin that flips the least tails which identifies it as an extreme point and thus, clearly not satisfactory of Hoeffding.

Thus is it and that satisfy single-bin Hoeffding and the answer is D

### Problem 3

We know that is the likelihood that and we know that in the probabilistic case, it is defined that is true with likelyhood.

There are two ways in which we can reach an error. Either while or while . The first case occurs with probability while the second case occurs with probability .

Thus we have an error with likelyhood which means the answer is E

### Problem 4

The performance of will be independent of in the case where out target distribution is purely noise, meaning that is defined as true exactly of the time. Which requires which makes the answer B. This makes sense because if then the truth of the binary statement would have some statistical tendency and since then the truth of the statement would have some statistical tendency as well that is dependent on .

We can also see that if we substitute into the expression from (3) we have:

So we have a static error rate of without any dependence on .

# See Attached code for methods for 5-10

### Problem 5

The result of the simulation for on average was 0.03485 which is closest to 0.01 which is C

### Problem 6

The result of the simulation for on average was 0.04404 which is closest to 0.01 which is C

### Problem 7

The post-regression took on average 4.214 iterations to converge which is closest to 1 which is A

### Problem 8

The average for the regression line was 0.505405 which is closest to 0.5 which is D

### Problem 9

was approximated for the 5 on 1000 runs labeled according to our final hypothesis and the results are as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | A | B | C | D | E |
| Approx. | 0.046 | 0.349 | 0.322 | 0.381 | 0.447 |

Thus, A is the best.

### Problem 10

The average approx over 1000 runs was 0.127 which is closest to 0.1 which is B