

Excel Randomize Function

Goal

We want to determine if the randomize function in Excel has a bias.

Data Collection

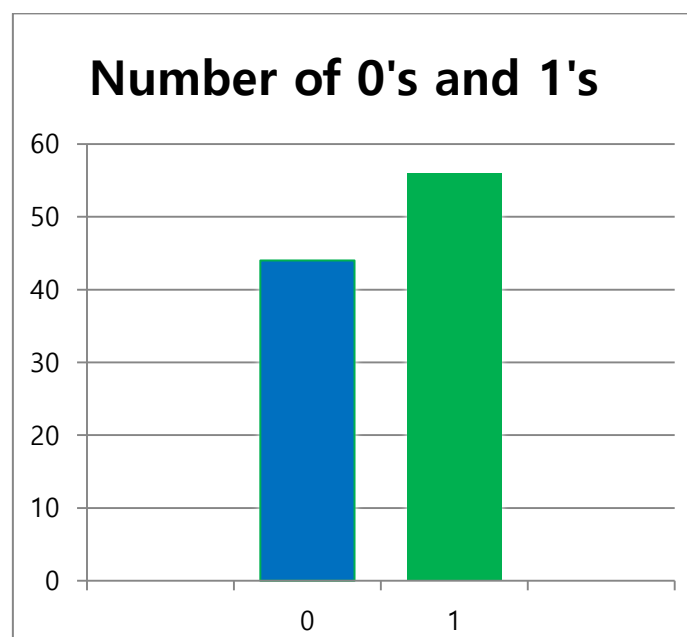
We collect 100 samples of 0 or 1 in Excel using the randomize function `RANDBETWEEN(0, 1)`.

We gather the results in a table.

| Value | N |
|-------|-----|
| 0 | 44 |
| 1 | 56 |
| Total | 100 |

Data Visualization

We can view the results of the randomize function on a bar graph.



Data Analysis

The expected number of 0's is 50 and the expected number of 1's is 50. We can see that the actual number of 1's is 56. Could this result arise from a normal distribution with $p = 0.5$, or is this the result of a bias?

The null hypothesis is that $p = 0.5$ for the selection of 1, and the alternate hypothesis is that the selection of 1 has a bias, that is, $p \neq 0.5$.

First, we can calculate the z-score for the sample.

$$z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1 - p_0)}{n}}}$$

$$z = \frac{0.56 - 0.5}{\sqrt{\frac{0.5(1 - 0.5)}{100}}} = 1.2$$

Data Validation

We want to know if the values in the data table can result from a normal distribution with a likelihood greater than 5%. That is, we will use a significance level of 0.05.

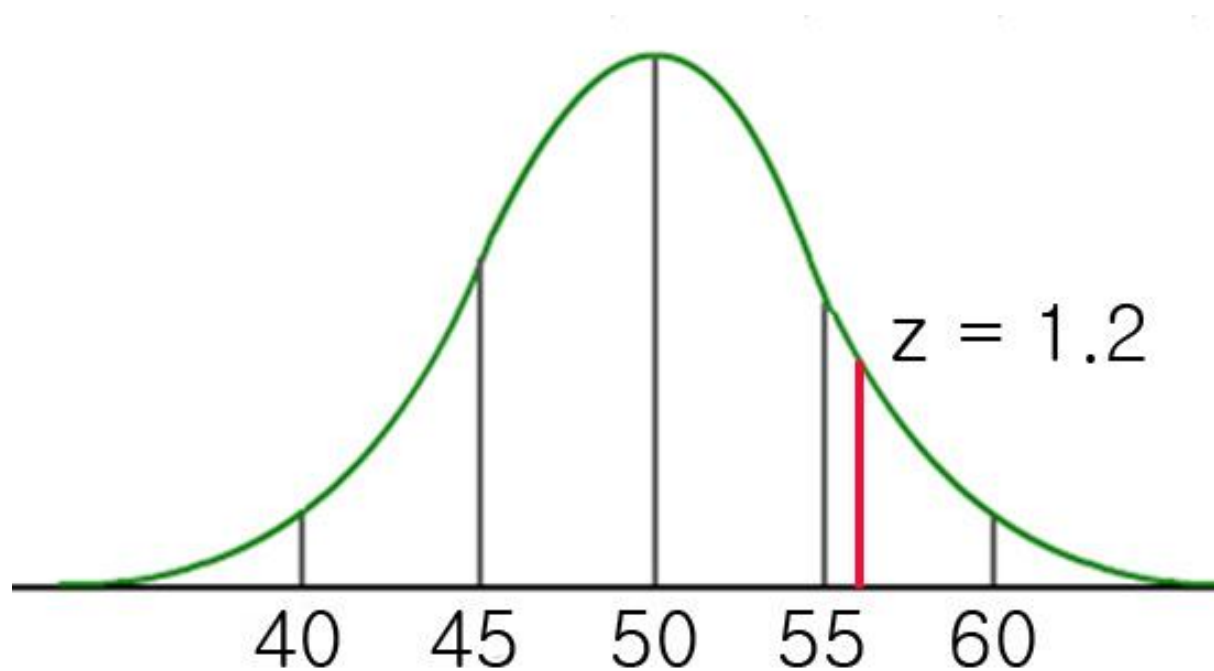
We can use the z-score to find the p-value using a two-tailed test.

Using an online calculator, we find that the p-value is 0.23 when the z-score is 1.2.

Using the standard significance level of 0.05, this result is not significant since $0.23 > 0.05$. Therefore, we accept the null hypothesis that $p = 0.5$, and we conclude that the Excel randomize function does not have a bias.

Data Visualization

We can view this result on the graph of a normal distribution.



Conclusion

We can be confident that the randomize function in Excel is fair and it does not have a bias.