**SABR #16 - Monte Carlo Simulations in Excel**

In Excel, you can create [Monte Carlo Simulations](https://en.wikipedia.org/wiki/Monte_Carlo_method) using random numbers and Data Tables. Simulations can be used to estimate probabilities or outcomes that would be otherwise difficult (maybe impossible) to calculate. We will typically be simulating events 1,000 times although the industry standard is 10,000 (very slow in Excel so use sparingly but always in competitions). [FiveThirtyEight](https://abcnews.go.com/538) uses Monte Carlo Simulations for all their election and sports predictions.



*Screenshot from* [*538’s 2022 NFL Predictions*](https://projects.fivethirtyeight.com/2022-nfl-predictions/)

Excel Tip #1: Put 1 in first cell. In Home tab, use Fill  Series in Columns (Step value=1, Stop value=1000) to create your table

Excel Tip #2: Here’s how to run a simulation using a [Data Table](https://www.excel-easy.com/examples/data-tables.html). Hit Function-'F9' to recalculate.

Excel Tip #3: When creating Data Tables leave 'row input' blank, and then choose any blank cell as 'column input'.

Excel Tip #4: If Excel is running very slow, create a new spreadsheet.

**Part I - Simulations for the not too difficult to calculate hypothetically**

**Use a different tab in Excel for each – Excel does not handle multiple data tables in one tab.**

1. Flip ONE fair coin (defined as each outcome equally likely) using **=rand()** and **=if(**. Flip it 1,000 times using a Data Table and find the experimental probability of Tails by using **=average(**. Note: the fact that the experimental probability approaches the hypothetical probability of 0.50 for larger and larger trials is due to the [Central Limit Theorem](https://en.wikipedia.org/wiki/Central_limit_theorem).

Graphical user interface, application, table, Excel

Description automatically generated

1. Flip TWO fair coins using **=rand()** 1,000 times using a Data Table and find the experimental probability distribution of Tails (X=0,1,2) using **=countif(** to count the number of Tails in the simulation. Why is landing one Tail the most likely outcome?

Graphical user interface

Description automatically generated with medium confidence

1. Roll ONE fair six-sided die using **=randbetween(1,6)** 1,000 times using a Data Table and find the experimental probability distribution of the outcomes (X=1,2,...,6) using **=countif(**.
2. Roll TWO fair six-sided dice using **=randbetween(1,6)** 1,000 times using a Data Table and find the experimental probability distribution of the outcomes (X=2,...,12) using **=countif(**. Why is a 7 the most likely outcome?

**Part II – This is our year!**

Pick an NFL team (except the Kansas City Chiefs!). Using their remaining schedule, we are going to create a simulation to determine the probability of making the playoffs. We are going to use the following playoff thresholds (wins to make the playoffs) – feel free to adjust:

* AFC Wild Card threshold = 9 wins
* NFC Wild Card threshold = 10 wins

However, your team’s best chance to make the playoffs may be by winning the division. You can calculate the current division leaders expected wins = current win %\*17.

Look up your team’s current winning percentage, and the win % of the remaining teams on their schedule (you could incorporate last year’s win % also if you so choose since teams have only played a few games).

For example, calculate the Bills win probability versus the Giants on a neutral field:





To account for home field advantage, add 0.03 (3%) for home games and subtract 0.03 (3%) for away games. You may change those adjustments if you see fit.

Do this for your team’s remaining schedule and tally the wins. Simulate the rest of the season at least 1,000 times and tally the number of wins in a frequency table (use **=countif(**).

What is the probability that your team makes the playoffs? Compare to the playoff projections from [ESPN’s NFL Football Power Index](https://www.espn.com/nfl/fpi/_/view/projections). How does yours compare?