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Report on Incoming Senate Confidential Election
Monday Nov. 5th

The random variable we forecast is: R = Number of Republican Senators in the 2019 Senate

a) The Basics

- The Senate has **100** Seats
- **42** Republicans (R) seats are **not** up for reelection
- **23** Democrats (D) seats are **not** up for reelection
- **35** Total seats are up for reelection
- Senators Sanders (VT) and King (ME) caucus with the Democratic party. Therefore the bounds for the number of Republicans senators after the Nov. 6th election are:
  [42 , 77]

b) Safe Elections, Elections in play

With the help of our data manager Dr. J., we collected and aggregated the most recent and reliable polls.
After further verification, we concluded that some races are essentially a "done deal". The following races are safe:

Democrats: **CT, DE, HI, MA, MD, ME, MN, NY, PA, RI, VI, VT, WA**
Republicans: **MS, UT, WY**

There are **3** safe Democrat races
There are **13** safe Republican races

Therefore, we revise our lower and upper bound for $\tilde{R}$: **[45 , 64]**

- The percent polled indicating a (R) or (D) vote, p_1 and p_2 do not sum to 1 because of possible third party candidates and undecided voters. We rescale them to sum to 1.

Note that this assumes the following behavior for undecided voters:
Undecided voters will vote for the two parties with rescaled p1 and p2 respectively.

- Just using the average estimates of % voting Republican for each rate, Column $\hat{p}$ in Table 1 below, we expect **8** Republican senators from the races "in play".
  Therefore we expect **53** Republican and **47** Democrats in the 2019 Senate.

d) Estimating the uncertainty

We can now estimate the uncertainty. See the complete Table 1

Table 1: Polls Results, Expectations and Uncertainty

State	$\hat{p}$	% U	s($\hat{p}$)	MOE	P(Win)	s_{MAX}
Arizona	47	5	0.013	0.026	0.02	0.026
Florida	48	10	0.009	0.018	0.01	0.026
Indiana	52	5	0.013	0.025	0.89	0.026
Michigan	45	6	0.017	0.034	0.00	0.034
Minnesota	47	12	0.018	0.035	0.03	0.035
Mississippi	57	33	0.022	0.043	1.00	0.043
Missouri	52	5	0.012	0.023	0.91	0.026
Montana	47	6	0.014	0.028	0.01	0.028
Nebraska	58	7	0.019	0.037	1.00	0.037
Nevada	53	12	0.015	0.029	0.99	0.029
New Jersey	47	11	0.019	0.038	0.07	0.038
New Mexico	41	21	0.013	0.026	0.00	0.026
North Dakota	54	0	0.013	0.025	1.00	0.026
Ohio	45	17	0.013	0.025	0.00	0.026
Tennessee	52	4	0.014	0.028	0.93	0.028
Texas	53	3	0.015	0.030	0.95	0.030
West Virginia	47	8	0.014	0.028	0.01	0.028
Wisconsin	42	7	0.014	0.028	0.00	0.028

- Average MOE for all the races: **2.9%**
- **0** of the Polls are reporting an MOE better than 5% ?

Note: %U is % undecided in unscaled poll estimate. MOE is 1.96 s($\hat{p}$), P(Win) is the probability of the Republican winning. s_{MAX} is, for each state, the worst of Nate Silver's 2.6% standard error (5/1.96) and the poll's self reported standard error.

e) Ready to simulate

- See Figures. 1 (based on Col. 4) and 2 (based on Col. 7) next page for the Senate Distribution.
- Given on the self-reported s_p, the probability of a Republican senated is **more concentrated**. Taking the larger s_P, it is **more dispersed**.
  Using larger Sp would make distribution more dispersed.
- We warn however that it is not reasonable to assume that the races are uncorrelated. Being Senate races they are all affected by national views on national issues such as (Kavangaugh, Metoo, The Economy, Immigration, etc..). A reasonable single factor could be simulated via an equal-correlation across the races.
- The effect of a positive correlation of the races would lead to a distribution **with larger deviation** compared to those of Figures 1 and 2.

THIS PAGE FOR THE TWO FIGURES

Figure 1:

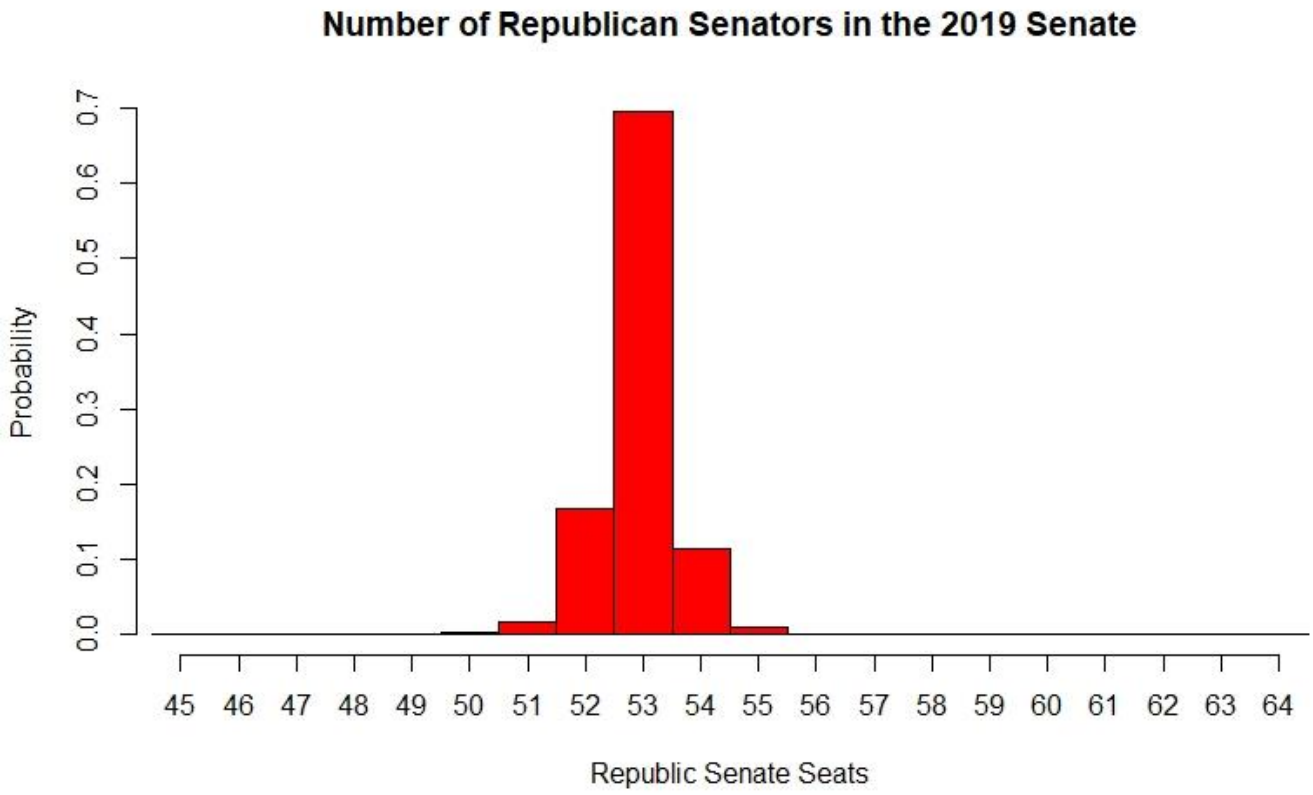

Figure 2