



How Nate Silver did it

| Michael Lieberman

During the 2012 election, Nate Silver drew fire for his projections.

Joe Scarborough, the conservative host of *Morning Joe* on MSNBC, attacked Silver during the election and Politico.com called him a “one-term” celebrity, saying, “For all the confidence Silver puts in his predictions, he often gives the impression of hedging.” (Later, Silver replied that Politico covers politics like sports but “not in an intelligent way at all.”)

But in the end, Silver beat them all. (And Scarborough eventually apologized, sort of, acknowledging that Silver did get it right.)

For those who don't know, Nate Silver writes the FiveThirtyEight blog in *The New York Times* and is the bestselling author of *The Signal and the Noise*. In the book, Silver examines the world of prediction, investigating how we can distinguish a true signal from a universe of noisy data. It is about prediction, probability and why most predictions fail - most, but not all.

What had folks attacking Silver was this: He predicted elections far more accurately than most pollsters and pundits on Politico, The Drudge Report, MSNBC and others. In his book, Silver described his model as bringing *Moneyball* to politics. That is, producing statistically-driven results. Silver actually popularized the use of probabilistic models in predicting elections by producing the probability of a range of outcomes, rather than just who wins. When a candidate is at, say, a 90 percent chance of winning, Silver will call the race. What made Silver famous was his extremely accurate prediction of voter percentages - an area where pundits are almost always far off the mark. And loath as pollsters may be to admit it, polls are almost always

wrong too. However, the average of polls is always more accurate. And a systematic probability model of the average of polls is almost always right. Think of it as political crowdsourcing.

One of the best models

Silver has built one of the best models out there. It's accurate, consistent and totally statistical. One advantage of being totally statistical is that his model can be replicated. This article will review the process and explain how Silver built his model, what his results mean and how to use them going forward.

The basics

To run Silver's model, you will need Microsoft Excel; a source of campaign finance and election data; and historical data to set “polling weights.”

The first step is to calculate the poll weight, which is a measure of how much an individual poll counts when averaged with other polls. The poll weight consists of three values:

- **Recency:** The older a poll, the lower the accuracy. A recency factor is calculated using a relatively simple decay function. Think of a poll as having a shelf-life - the longer on the shelf, the less potent the poll is.
- **Sample size:** When shown on television, a poll might have a spread of +/- 4 percent. This spread is calculated using sample size. As a general rule, the larger the sample size, the more accurate the poll.
- **Pollster rating:** Silver alludes to how his polling does this in a 2010 blog. He does not, however, completely reveal his secret

sauce. Without going into too much statistical detail, Silver uses historical data and regression analysis to create an accuracy measure for pollsters. Better pollsters have positive ratings; worse have negative ratings.

After the information is created, the next step is to create a weighted polling average. That is, take the mean of each poll within the state using the three weights described above. For smaller races, like congressional or state races, polling data might be scarce, particularly in uncontested races. However, presidential contests, as we know, offer a deluge of data to be plugged in. Silver does not say exactly how he combines the weights. I multiply them and then weight the polls.

Error

A weighted polling average, like all averages, contains an error and a weighted mean. The weighted mean is the exact result - the one number that pops out of the calculation. Error is the average distance of each data point to the weighted mean. In creating a polling prediction, we utilize the error around the weighted mean. The smaller the average distance around the weighted mean - the error - the more accurate the poll.

When examining what Silver considers important in interpreting error, we get a good snapshot of what makes a poll accurate and what makes a poll less accurate:

- Error is higher in races with fewer polls.
- Error is higher in races where the polls disagree with each other.
- Error is higher in races with a large number of undecided voters.
- Error is higher when the margin between the two candidates is lopsided.
- Error is higher the more days prior to Election Day the poll is conducted.

The presidential simulation

Silver predicts a lot of races: U.S. House, U.S. Senate and state governorships. The mother of all elections is, of course, the presidential.

If I were going to construct Silver's model for the presidential election, I would set up 51 state worksheets in Excel. Each state worksheet would contain the polling data and weights for a state. We configure the 51 worksheets so each poll has its result, its weight and its error. For one run of a simulation, each poll would have one value, producing one weighted average for the state. The winner would then be declared. Excel would assign the electoral votes for that state. The front worksheet of my Nate Silver model would show all 51 states, tally who gets more than 270 electoral votes and predict the winner.

However, if you run the simulation, say, 10 million times, each poll has results that bounce around within its error, spitting out 10 million possible outcomes. When arrayed in a cumulative chart, all possible results are shown.

Exactly what Silver meant

One week before the 2012 Presidential election, Silver reported that President Obama had a 73 percent chance of

being reelected. Of course, the prediction caused howls from Fox News. But while they bayed in protest, none explained exactly what Silver meant.

Silver ran his model eight days before the election. As I stated earlier, polls become more accurate closer to Election Day. Let's say that Silver ran his model 10 million times (with a new laptop this would take, oh, about four minutes). With states such as New York, California, Texas or Georgia, the outcome was never in doubt. But in swing states such as Virginia, Florida and particularly Ohio, the polls were too close to call. The winners may change for different iterations. If one runs the all possible iterations and combinations (and I would say that 10 million would probably cover it), then one can say how many times each side triumphs.

When Silver ran his models with the most current polls, 7.3 million times President Obama came out with more than 270 electoral votes; Mitt Romney won 2.7 million times. Thus, pronounced Silver, President Obama had a 73 percent chance of winning because he won 73 percent of the 10 million simulations.

Predicting the actual vote percentages is a little more difficult. However, when one had as much data as Silver and the ability to run the simulations millions of times, the actual vote count will converge to the real number, much like crowdsourcing guesses often converge to the result.

Practical uses

Practical uses of Silver's model are abundant and not solely on a presidential level. For example, if someone is working for a campaign in which the candidate is leading in the polls by 48 percent to 46 percent - a margin that in reality is a statistical tie - a month or two before Election Day, how likely is that candidate to actually win? And if the candidate is behind by five points with one month to go, how much ground does the campaign really need to make up?

A prediction model can answer these questions. If one candidate is leading by five points one month prior to Election Day in that or similar districts, 80 percent of the time s/he wins. This can be arrived at by looking at historical data or by plugging in all the current polls and financial data and running the simulation 10 million times.

Opinions and predictions

Political pundits like Dick Morris, Rush Limbaugh and Matt Drudge are paid to fill air time and give their opinions. Their opinions and predictions are almost always wrong. By contrast, Silver scientifically boils down real data and makes accurate predictions. The coming of age of probabilistic models in mainstream political modeling was brought about by Nate Silver and it is here to stay. It's called math. 

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