FORECAST ERROR: 2016 PRESIDENTIAL ELECTION PREDICTORS

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An edited version of this article was originally published at
https://www.significancemagazine.com/politics/243

PART 0: TAGLINE
The Republican candidate Donald John Trump lost the popular vote to his Democratic rival Hillary Rodham Clinton but is predicted to receive 306 electoral votes to Clinton's 232 when the Electoral College meets in December 2016. Timothy Martyn Hill reviews the predictions - and the errors - that were made.

PART 1: THE ELECTION
On July 14th 2016 the Republican Donald John Trump was polling seven[1027a] points ahead of Hillary Rodham Clinton. A billionaire property developer who had never been elected to any office was beating the Secretary of State and former Senator for New York. If he could maintain those numbers, Trump would be in the White House by January 2017. As the campaign wore on, his support oscillated but never overtook Clinton for very long.[1120d] Before dawn on polling day one modeller rated the chance him losing as over 99%[1120c].

Thirty-six hours later he was President-elect, having won a majority of votes in the Electoral College even though Clinton had won the popular vote.

Billions[1027c] of dollars had been spent, modellers had predicted, bookies had taken bets, pollsters had polled. Which of them had predicted the outcome and how far out had they done so? This article sets out to answer that question, by analysing the performance of pollsters, seat and vote modellers, and betting firms from all the way up to election day 2016.

PART 2: WHICH CANDIDATES SHALL WE COVER?
Firstly we have to deal with the thorny question of "Which candidates shall we deal with?" Whilst acknowledging the long history of third-party and independent candidates, this article will not include them, simply because there aren't enough predictors that cover them. We briefly considered the merits of a one-party forced format ("will the incumbent party win or not?"), particularly its simplicity, but in the end we chose the two-party-forced format.

- Two-party-forced format. In the two-party-forced format the predictions for undecided, don't knows, and every other candidate will be proportionally reallocated to the official Democratic and Republican candidates. Prediction of a party without naming the candidate will be deemed to refer to the candidate of that party.

This format can cause problems with the MAE (see Appendix 4 for a discussion), but it is more comprehensible to the readership and it matches the format used by predictors [1121h].

PART 3: HOW TO ASSESS THE INACCURACY OF A PREDICTION
Secondly, we need to work out how best to judge the accuracy of a prediction. In previous articles we selected mean absolute error (MAE). It or its variants are widely understood by pollsters and modellers and it can be used for any finite prediction that can be handled arithmetically. But we also pointed out[0910d] that there are problems with using MAE for a two-party-forced election, since it has no direction and doesn't differentiate between an underestimate and an overestimate. To get around these problems we will also note whether the predictor actually predicted the winner (WIN). For a two-party-forced prediction the definitions of MAE and WIN are given below.

- MAE = Mean Absolute Error = [|prediction A – result A| + |prediction B – result B|]/2, where "A" is one candidate and "B" is the other candidate.
- WIN = Did it predict the winner? = "1" if it did, "0" if it didn't

An example MAE calculation for a two-party-forced prediction is given in Figure 1 (below).

Figure 1: example MAE calculation for a two-party-forced prediction

Candidate	Prediction	Two-party-forced	Popular vote	Two-party-forced	Absolute error
Clinton	54%	0.57	51%	0.52	|0.57-0.52|=0.05
Trump	40%	0.43	47%	0.48	|0.43-0.48|=0.05
Others	6%	-	2%	-	
Total	100%	1.00	100%	1.00	
				Total absolute error	0.05 + 0.05 = 0.1
				Mean absolute error	0.1/2 = 0.05

PART 4: WHICH PREDICTORS SHALL WE ASSESS?

Predictors fall into broadly three types: electoral college predictors, vote share predictors and probabilistic predictors, predicting the number of electoral college votes, the percentage of the vote and the probability of a win respectively. Examples of predictors include betting odds, opinion polls, mathematical models, campaign spending and many more. Pressure of time meant that we had to neglect campaign spending, but that still leaves the following:

- **Betting odds.** These are usually translated into the probability of a win
- **Opinion polls.** Polls are not formally predictors but they have been used as such. They are usually translated into a predicted vote share. For logistics reasons we will consider nationwide opinion polls but we will not consider statewide opinion polls. If a poll issues two or more figures for a given day then we will take an average for that day. Such averaging may flatter the poll: see Appendix 3 for further discussion.
- **Academic and other predictors.** These may predict electoral college votes, vote share, or probability of win

In accordance with our usual practice we will select a maximum of five predictors for each category.

PART 5: WHICH RESULTS SHALL WE MEASURE PREDICTIONS AGAINST?

The Electoral College will not meet until December 19th 2016 and will not be certified by Congress until January 6th 2017[1120a]. So the official results are not available. Instead we will use estimates at November 16th 2016[1120b]. They are given below, along with the two-party-forced version. The WIN parameter designates the winner and the postfacto probability of success.

Figure 2: estimated results at 2016-11-16[1120b] of the 2016 US Presidential Election

President	Party	Popular vote	%	2pf	WIN	ECV	%	2pf	WIN	Source
Trump	Republican	61,103,697	46.86%	0.496	0	306	56.9%	0.569	1	[1120b]
Clinton	Democratic	62,086,517	47.62%	0.504	1	232	43.1%	0.431	0	[1120b]
Johnson	Libertarian	4,257,135	3.27%	0.000	0	0	0.0%	0	0	[1120b]
Stein	Green	1,297,323	1.00%	0.000	0	0	0.0%	0	0	[1120b]
Write-ins	-	671,979	0.52%	0.000	0	0	0.0%	0	0	[1120b]
Mullin	Indep.	513,763	0.39%	0.000	0	0	0.0%	0	0	[1120b]
Other (+)	-	453,487	0.35%	0.000	0	0	0.0%	0	0	[1120b]
	Total	130,383,901	100.00%	1.000		538	100.0%	1.000		[1120b]

So we have worked out the predictors we will assess, the candidates they predict, and the metrics we will use to measure their accuracy. How well did they do?

PART 6: CHANGES OVER TIME

So, how did our predictors behave over time?

Nationwide Opinion Polls

An individual may be commissioned by one entity, conducted by another, and published by a third, and they may be referred to by any combination of the three – for example, the "Ipsos/Reuters" poll. Entities that conducted, commissioned, or published nationwide opinion polls for the 2016 Presidential election are given below, with their collaborators in brackets.

- ABC News (with Washington Post and Langer Research Associates), Associated Press (GFK), Bloomberg Politics (Selzer), Breitbart (Gravis Marketing), CBS News (New York Times), CNN (Opinion Research Corporation , aka ORC), Echelon Insights, Emerson College, Fairleigh Dickinson University, Fox News, Franklin Pierce University (Boston Herald), George Washington University, Google Consumer Surveys, Greenberg Quinlan Rosner, IBD/TIPP, iCitizen, Insights West, McClatchy (Marist), Monmouth University, Morning Consult (Politico), NBC News (Wall Street Journal &Hart Research Associates, or SurveyMonkey), Normington, Petts & Associates, One America News Network (Gravis Marketing), Penn Schoen Berland, Pew Research, Princeton Survey, Public Policy Polling, Public Religion Research Institute (The Atlantic), Quinnipiac University, RABA Research, Rasmussen Reports (Pulse Opinion Research, LLC), Reuters (Ipsos), Saint Leo University, Suffolk University (USA Today), SurveyUSA (Boston Globe), The Economist (YouGov), University of Delaware, Zogby Analytics

To match our previous article on the 2012 election, we selected the following:

- ABC News/Washington Post (conducted by Langer Research Associates, a phone poll including cellphones)
- CNN (by Opinion Research Corporation, a phone poll including cellphones)
- Rasmussen (by Pulse Opinion Research, LLC, a robocall/internet poll omitting cellphones)
- Reuters (by Ipsos, an internet poll)
- NBC News (by Wall Street Journal & Hart Research Associates, a phone poll including cellphones. or by SurveyMonkey, an internet poll)

The selections were predictors of popular vote. The resulting MAEs and WINs are given below. If a predictor issues two or more figures for a given day then we will take just one of the figures or take an average for that day. That latter point may flatter the predictor slightly: see Appendix 3 for a discussion.

Figure 3. MAEs on/before to November 8th 2016
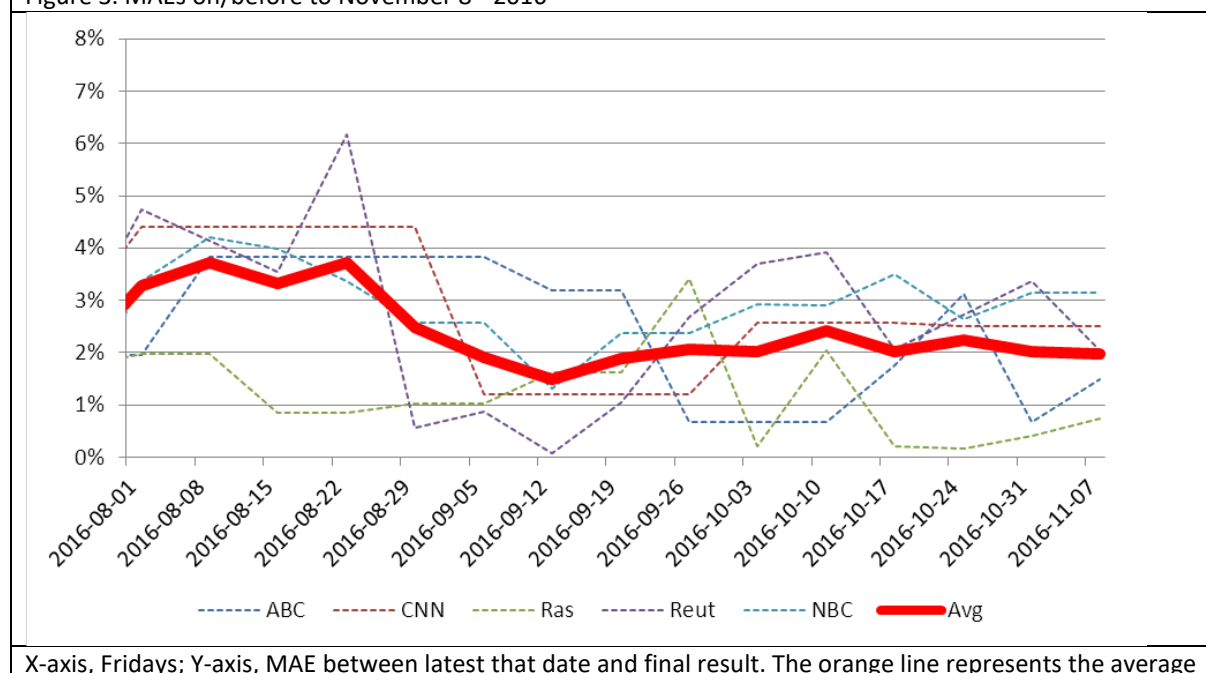
X-axis, Fridays; Y-axis, MAE between latest that date and final result. The orange line represents the average

Figure 4: WINs prior to November 8th 2016. 1 = Clinton wins popular vote, 0 = Trump wins popular vote.

Tuesdays before election	Election day 2016-11-08	1 week before election	2	3	4	5	6	7	8	9	10	11	12
ABC	1	1	1	1	1	1	1	1	1	1	1	1	1
CNN	1	1	1	1	1	1	0	0	0	0	1	1	1
Rasmussen	1	1	1	1	1	1	0	0	0	0	0	1	1
Reuters	1	1	1	1	1	1	1	0	1	1	1	1	1
NBC	1	1	1	1	1	1	1	1	1	1	1	1	1
Total predicting Clinton wins popular vote (out of 5)	5	5	5	5	5	5	3	2	3	3	4	5	5

In terms of predicting a popular vote winner, our five selections were fairly reliable, with most of them predicting a Clinton win. If Clinton had won the Electoral College as well, the pollsters' performance would have been seen as acceptable – albeit barely, according to a previous analysis of UK election forecasts[1122a]

Modellers And Other Predictors

Modellers and other predictors for the 2016 Presidential election were as follows:

- The modellers include Abramowitz (Time for change model), Campbell (Convention-bump model and Trial-heat model), Cuzán (Fiscal model), DeSart (Long-Range-Presidential), Erikson and Wlezien (Leading economic indicators and polls), Fair (Economic voting model), Holbrook (National conditions and trial-heat), Jérôme & Jérôme (State-level political economy model), Lewis-Beck and Tien (Political Economy Model), Lichtman (Keys to the White House), Lockerbie (Expectations model), Moody's Analytics (Moody's), Norpoth (Primary model), PollyVote (Graefe/Jones/Armstrong/Cuzán), Silver (538 polls-plus), Wang (Princeton Election Consortium). The others include Hypermind , Iowa Electronic Markets (IEM), Upshot (New York Times) , Predictit, and Predictwise

To match our previous article on the 2012 election, we selected the following:

- Alan Abramowitz's "Time for Change" model, which uses presidential approval rating, economic factors, incumbency and voting polarisation.
- Robert Erikson and Christopher Wlezien's "Leading economic indicators and polls" model, which uses economic indicators and opinion polls.
- Ray Fair's "Economic voting" model, which uses economic indicators and a few non-economic ones.
- Helmut Norpoth's "Primary" model, which uses votes in the party primaries.
- Nate Silver of FiveThirtyEight's "polls plus" model, which uses opinion polls plus economic data.

They predicted popular vote, the ECV or Presidency, and the resultant popular vote MAEs are given below.

Figure 5. MAEs on/before November 8th 2016
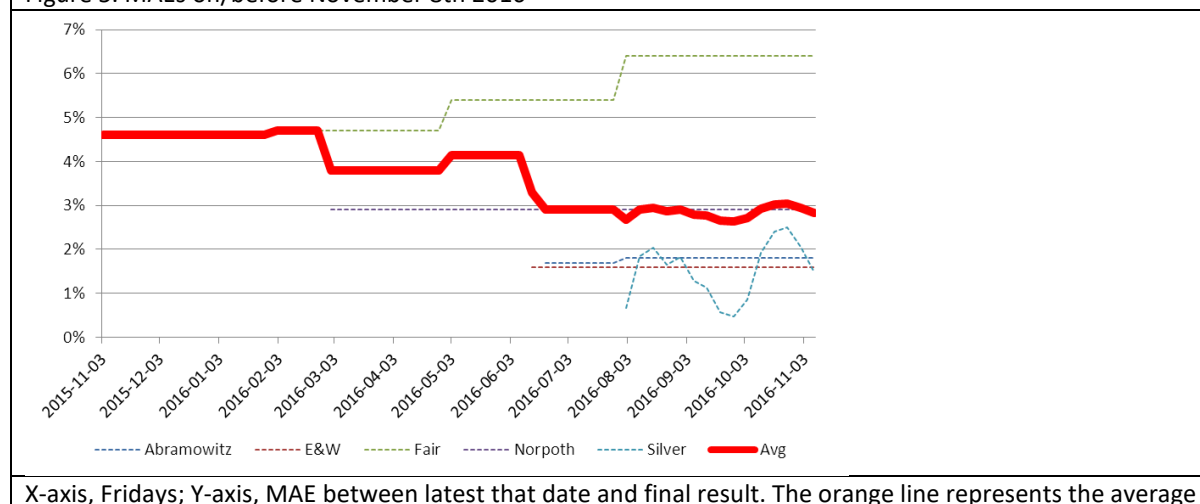
X-axis, Fridays; Y-axis, MAE between latest that date and final result. The orange line represents the average

The winner predictions over time were:

Figure 6: WINs prior to November 8th 2016. 1 = Clinton wins popular vote, 0 = Trump wins popular vote.

Tuesdays before election	Election day 2016-11-08	1 week before election	2	3	4	5	6	7	8	9	10	11	12
Abramowitz*1	0	0	0	0	0	0	0	0	0	0	0	0	0
Erikson and Wliezen	1	1	1	1	1	1	1	1	1	1	1	1	1
Fair	0	0	0	0	0	0	0	0	0	0	0	0	0
Norpoth	0	0	0	0	0	0	0	0	0	0	0	0	0
Silver	1	1	1	1	1	1	1	1	1	1	1	1	1
Total predicting Clinton wins popular vote (out of 5)	2	2	2	2	2	2	2	2	2	2	2	2	2

*1 Abramowitz's model predicted a Trump win, but he disavowed it. We took the model, not the modeller

Figure 7: WINs prior to November 8th 2016. 1 = Trump wins ECV/Presidency, 0 = Clinton wins ECV/Presidency.

Tuesdays before election	Election day 2016-11-08	1 week before election	2	3	4	5	6	7	8	9	10	11	12
Abramowitz*1*2	1	1	1	1	1	1	1	1	1	1	1	1	1
Erikson and Wliezen	0	0	0	0	0	0	0	0	0	0	0	0	0
Fair*2	1	1	1	1	1	1	1	1	1	1	1	1	1
Norpoth	1	1	1	1	1	1	1	1	1	1	1	1	1
Silver	0	0	0	0	0	0	0	0	0	0	0	0	0
Total predicting Trump wins ECV/Presidency (out of 4)	3	3	3	3	3	3	3	3	3	3	3	3	3

*1 Abramowitz's model predicted a Trump win, but he disavowed it. We took the model, not the modeller
*2 Fair and Abramowitz's models predicted a Trump popular vote share win but did not explicitly predict a Trump Presidency. This analysis infers the latter from the former

This picture is more mixed. The majority of our five selections did not predict that Clinton would win the popular vote and their MAE's were larger than the polls. So that's bad. Their predictions of the Presidency (whether explicit or implicit) were closer to the outcome, but they were unsure and Abramowitz disavowed his own model

Betting Odds And Spreads
Bookies for the 2016 Presidential election were as follows:

- 10Bet, 188 Bet, 32Red, 888sport, Bet365, BetBright, BetDaq, BetFair, Betfair Exchange, BetFred, BetOnline, Betstars, BetVictor, Betway, Black Type, Bovada, BoyleSports, Bwin, Coral, Ladbrokes, Marathon, Matchbook, NetBet, PaddyPower, Skybet, SportingBet, SportingIndex, StanJames, Totesport, UniBet, William Hill, Winner

To match our previous article on the 2012 election, we selected the following:

- Betfair: a London-based bookie that covers both fixed-odds and exchange betting (as "Betfair Exchange").
- We could not reselect Intrade (a Dublin-based bookie that covered exchange betting) because it ceased trading in 2013. Instead we selected Betfair Exchange
- Ladbrokes: a London-based bookie that covers fixed-odds
- William Hill: a London-based bookie that covers fixed-odds
- PaddyPower: a Dublin-based bookie that covered fixed-odds. Merged with Betfair in 2016

The bets pay out if the selection gains a projected majority in the Electoral College (and hence the Presidency), not if the selection wins the popular vote. Consequently all of our selections were measuring the probability of winning the Presidency. If we compare those probabilities to the result (Trump won) then the resulting MAEs are given in Figure 8.

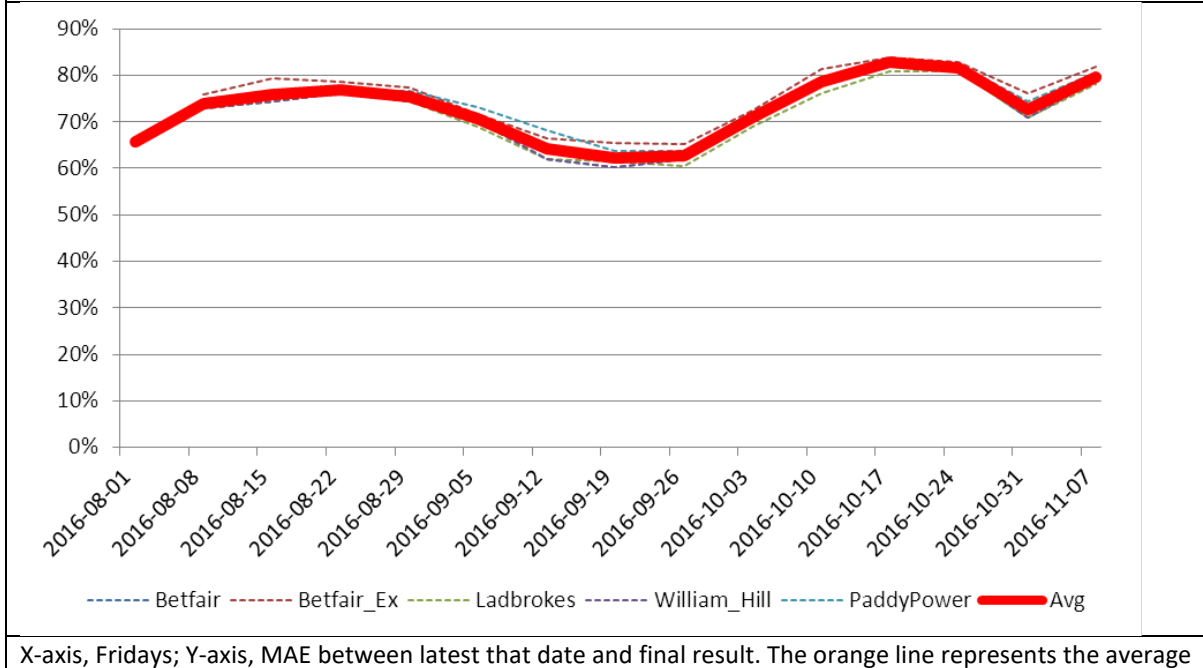Figure 8. MAEs on/before November 8th 2016

X-axis, Fridays; Y-axis, MAE between latest that date and final result. The orange line represents the average

Figure 9: WINs prior to November 8th 2016. 1 = Trump wins ECV/Presidency, 0 = Clinton wins ECV/Presidency.

Tuesdays before election	Election day 2016-11-08	1 week before election	2	3	4	5	6	7	8	9	10	11	12
Betfair	0	0	0	0	0	0	0	0	0	0	0	0	0
Betfair Exchange	0	0	0	0	0	0	0	0	0	0	0	0	0
Ladbrokes	0	0	0	0	0	0	0	0	0	0	0	0	0
William_Hill	0	0	0	0	0	0	0	0	0	0	0	0	0
PaddyPower	0	0	0	0	0	0	0	0	0	0	0	0	0
Total predicting Trump wins ECV or Presidency (out of 5)	0	0	0	0	0	0	0	0	0	0	0	0	0

Slice it any way you want, but this is awful. Yet again the MAEs for probabilistic predictions are excessive, and they were unanimous throughout that that Clinton would win the ECV/Presidency.

PART 7: THE LAST DAY
For each selected predictor, the predictors on the last day and their resultant MAEs and WINs are given below

Nationwide Opinion Polls
Figure 10a: Last vote share predictions on/before 2016/11/08. WIN = 1 if predicted Clinton win popular vote

Predictor of vote share	mm-dd	DJT raw	HRC raw	DTJ 2PF	HRC 2PF	DTJ result 2PF	HRC result 2PF	MAE	WIN	Source
ABC News/WaPo *2	11-06	0.460	0.490	0.484	0.516	0.496	0.504	0.012	1	[1115a]
ABC News/WaPo *3	11-06	0.430	0.470	0.478	0.522	0.496	0.504	0.018	1	[1115a]
CNN/ORC *2	10-23	0.450	0.510	0.469	0.531	0.496	0.504	0.027	1	[1115b]
CNN/ORC *3	10-23	0.440	0.490	0.473	0.527	0.496	0.504	0.023	1	[1115b]
NBC News/SurveyMonkey *2	11-06	0.440	0.510	0.463	0.537	0.496	0.504	0.033	1	[1115c]
NBC News/SurveyMonkey *3	11-06	0.410	0.470	0.466	0.534	0.496	0.504	0.030	1	[1115c]
Rasmussen Reports *3	11-06	0.430	0.450	0.489	0.511	0.496	0.504	0.007	1	[1115d]
Ipsos/Reuters *3	11-06	0.390	0.420	0.481	0.519	0.496	0.504	0.015	1	[1115e]
Ipsos/Reuters *2	11-06	0.390	0.440	0.470	0.530	0.496	0.504	0.026	1	[1115e]

*2 When given a choice of Clinton, Trump, or other
*3 When given a choice of Clinton, Trump, Johnson, Stein or other.

Modellers And Other Predictors

Figure 10b: Last vote share predictions on/before 2016/11/08. WIN = 1 if predicted Clinton win popular vote

Predictor of vote share	mm-dd	DJT raw	HRC raw	DTJ 2PF	HRC 2PF	DTJ result 2PF	HRC result 2PF	MAE	WIN	Source
Abramowitz	10-12	0.514	0.486	0.514	0.486	0.496	0.504	0.018	0	[1115g]
Erikson and Wlezien	06-13	0.480	0.520	0.480	0.520	0.496	0.504	0.016	1	[1115h]
Fair	10-28	0.560	0.440	0.560	0.440	0.496	0.504	0.064	0	[1115i]
Norpoth	03-07	0.525	0.475	0.525	0.475	0.496	0.504	0.029	0	[1115j]
Silver	11-08	0.450	0.485	0.481	0.519	0.496	0.504	0.015	1	[1115k]

Figure 10c: Last probability predictions on/before 2016/11/08. WIN = 1 if predicted Trump win Presidency

Predictor of probability of Presidency	mm-dd	DJT raw	HRC raw	DTJ 2PF	HRC 2PF	DTJ result 2PF	HRC result 2PF	MAE	WIN	Source
Abramowitz*1	10-12	0.660	0.340	0.660	0.340	1	0	0.340	1	[1115g]
Erikson and Wlezien	06-13	0.180	0.820	0.180	0.820	1	0	0.820	0	[1115h]
Fair	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	[1115i]
Norpoth	03-07	0.870	0.130	0.870	0.130	1	0	0.130	1	[1115j]
Silver	11-08	0.282	0.718	0.282	0.718	1	0	0.718	0	[1115k]

*1 Abramowitz's model made a prediction of a "66% chance of a Republican victory" but did not explicitly state whether it was a victory in the popular vote or the ECV. This analysis assumes the latter.

Figure 10d: Last ECV predictions on/before 2016/11/08. WIN = 1 if predicted Trump win ECV

Predictor of ECV	mm-dd	DJT raw	HRC raw	DTJ 2PF	HRC 2PF	DTJ result 2PF	HRC result 2PF	MAE	WIN	Source
Silver	11-08	235.6	301.6	0.439	0.561	0.569	0.431	0.130	0	[1115k]

Betting Odds And Spreads

Figure 10e: Last probability predictions on/before 2016/11/08. WIN = 1 if predicted Trump win ECV/Presidency

Predictor of probability of ECV/Presidency	mm-dd	DJT raw	HRC raw	DTJ 2PF	HRC 2PF	DTJ result 2PF	HRC result 2PF	MAE	WIN	Source
Betfair	11-08	0.222	0.833	0.211	0.789	1	0	0.789	0	[1115f]
Betfair_Ex	11-08	0.186	0.833	0.183	0.817	1	0	0.817	0	[1115f]
Ladbrokes	11-08	0.231	0.820	0.220	0.780	1	0	0.780	0	[1115f]
William_Hill	11-08	0.222	0.833	0.211	0.789	1	0	0.789	0	[1115f]
PaddyPower	11-08	0.200	0.833	0.194	0.806	1	0	0.806	0	[1115f]

These are decidedly mixed results.

The pollsters can point to the fact that they correctly predicted a Clinton popular vote win and some of them can go further and state that they were reasonably accurate: ABC's 46% Trump 49% Clinton, for example. But in broad those MAEs are too large. The modellers were split: some predicted a Clinton popular vote win, some a Trump Presidency. As for the betting odds: well, they were just a great big heap of wrong.

PART 8: CONCLUSION

Judging from the early commentary, the 2016 US Presidential Election will be seen as the latest of a series of elections which the experts got wrong. This is both fair and unfair, and it needs to be understood why.

Nationwide Opinion Polls

The pollsters are being excoriated for not predicting the Trump Presidency. They can legitimately claim in their defence that they predicted a Clinton popular vote win: as the song has it, "they never promised you a Rose

Garden".[1120e] They cannot be blamed for not predicting a Trump Presidency because they don't predict Presidencies, just the vote…although one suspects that this defence will not find universal favour.

As for accuracy in predicting vote share, the picture is mixed. Some characterise the nationwide polls as a miss or a real error[1121c], some state that they may be more accurate than previous elections[1121d][1121j]. Millions of ballots remain uncounted and the totals at the time of writing will not be the same when Congress meets in January.[1121f] So it is too early to tell.

Statewide Opinion Polls

Regardless of how well the nationwide opinion polls did, the statewide polls must be mentioned here. States are not statistically independent and polling errors in one state are likely to be reflected in similar states[1121b][1121c]. In 2016 the polling errors were spread unevenly, with Trump outperforming his polls in Midwestern states like Iowa, Ohio, Pennsylvania, Wisconsin and Minnesota[1121c][1121e][1121j].
This had implications for the Electoral College, with states that flipped from Obama to Trump like Iowa, Ohio, Pennsylvania and Wisconsin proving crucial in the Trump victory[1121i].

Modellers And Other Predictors

The modellers had a mixed war. Helmut Norpoth correctly predicted a Trump presidency[1114a]: his Lebo/Norpoth model based on leader ratings[1114b] may have correctly predicted the 2015 UK General Election had he kept faith with it unaltered, and (despite adjustments to include South Carolina[1114a]) he stuck to his Primary Model for POTUS 2016 and correctly predicted Trump several months out. Alan Abramowitz had the reverse problem: his "Time for Change" model predicted a Trump win in the popular vote[1114c] and presumably the Presidency, but he disavowed it[1114c]. To avert an unkind interpretation that he simultaneously predicted a Trump popular vote win and a Clinton Presidency, we have taken the model not the modeller. As for Nate Silver, simultaneously criticised for being too anti-Clinton[1114d][1114f] and too unsure[1114e], the author has only sympathy and notes his vindication[1114g][1114h][1121g]

Betting Odds And Spreads

The bookies had a profitable night[1122b]: which is the most that can be said for them. The popular conceit that odds predict because punters bet real money is a fallacy. Even when odds correctly predict the winner their errors are large, and when they predict the wrong winner the size of their errors are, to quote President-elect Trump, "huge".

APPENDIX 1: ACKNOWLEDGEMENTS

APPENDIX 2: REFERENCES

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APPENDIX 3: SAME-DAY ABUNDANCE AND PROLIFERATION FLATTERY

A predictor may issue more than one prediction on a single day. Bookies may alter their prices as the day progresses, modellers may run more than one model, pollsters may release more than one poll. Additionally a single prediction may consist of more than one set of numbers. We cope with this same-day abundance in the following ways

- **Betting odds**. For this article betting odds were sampled at a given moment on a given day and are deemed to be that bookie's odds for that day.
- **Modeller predictions**. Modellers are prone to increase their number of models as time progresses. Silver/FiveThirtyEight in 2016 issued a nowcast, an aggregator ("polls-only") and a model ("polls-plus"). Hix in 2010 issued a uniform national swing model, a differential regional swing model, and a third model with differential regional swings and a marginal seat effect[2902c]. For this article we counted each model separately even if they were from the same modeller.
- **Opinion polls (between-polls abundance)**. A pollster may release more than one poll on one day. For this article we counted each poll separately even if they were from the same pollster
- **Opinion polls (within-polls abundance)**. A pollster may issue a poll which contains more than one set of figures, for example, it may give voting preference when given a choice of four candidates, and voting preference when given a choice of two candidates. To cope with this we decided to take the same-day average of poll numbers from a given poll on a given day. This had the side effect of flattering the pollster slightly: if a poll gives Clinton 50/Trump 40, and Clinton 46/Trump 44, then the same-day average (Clinto 48/Trump 42) would have a smaller MAE than the extrema. We called this phenomenon "proliferation flattery". We avoided it in our last day analysis by extracting each individual set of figures from each individual poll and analysing them separately.

APPENDIX 4: MAE AND TWO-PARTY-FORCED FLATTERY

In previous articles we pointed out[0910d] that there are problems with using MAE for a two-party-forced (2PF) election, since it has no direction and doesn't differentiate between an underestimate and an overestimate.

But another disadvantage was not mentioned: predictions with the same MAEs on the raw prediction will have different MAEs on a two-party-forced basis. Consider the following examples

- **Example 1:** Prediction 10%/15% vs result 15%/20%, **raw MAE = 5%**
- **Example 2:** Prediction 20%/25% vs result 25%/30%, **raw MAE = 5%**
- **Example 3:** Prediction 30%/35% vs result 35%/40%, **raw MAE = 5%**
- **Example 4:** Prediction 40%/45% vs result 45%/50%, **raw MAE = 5%**

In these examples the MAE on raw predictions is 5%. But when we calculate the MAE on 2PF basis, we see this:

Figure 11: the 2PF MAE for examples 1 to 4

Example	Vote for A (raw)	Vote for B (raw)	Total (raw)	Vote for A (2PF)	Vote for B (2PF)	Result for A (raw)	Result for B (raw)	Total (raw)	Result for A (2PF)	Result for B (2PF)	**MAE (raw)**	**MAE (2PF)**
1	0.100	0.150	0.250	0.400	0.600	0.150	0.200	0.350	0.429	0.571	**0.050**	**0.029**
2	0.200	0.250	0.450	0.444	0.556	0.250	0.300	0.550	0.455	0.545	**0.050**	**0.010**
3	0.300	0.350	0.650	0.462	0.538	0.350	0.400	0.750	0.467	0.533	**0.050**	**0.005**
4	0.400	0.450	0.850	0.471	0.529	0.450	0.500	0.950	0.474	0.526	**0.050**	**0.003**

We see that fixing the MAE on a raw basis does not fix the MAE on a 2PF basis, and that a 2PF MAE may flatter a larger prediction, thus

- **Example 1:** Prediction 10%/15% vs result 15%/20%, raw MAE = 5%, **2PF MAE = 2.9%**
- **Example 2:** Prediction 20%/25% vs result 25%/30%, raw MAE = 5%, **2PF MAE = 1.0%**
- **Example 3:** Prediction 30%/35% vs result 35%/40%, raw MAE = 5%, **2PF MAE = 0.5%**
- **Example 4:** Prediction 40%/45% vs result 45%/50%, raw MAE = 5%, **2PF MAE = 0.3%**

We called this phenomenon "two-party-forced flattery": the MAE for two-party-forced predictions by definition ignores votes for other voters, and predictions with large fixed-size errors but the same party ratio as the result may not have large raw MAEs. For American Presidential elections with a high two-party total such as 2012 (where Obama/Romney combined got over 98% of the vote) this is not noticeable because the two-party-forced vote ≈ the raw two-party vote. But for 2016 (where early totals give Clinton/Trump combined less than 95% of the vote) it began to become noticeable. This is not a problem with respect to comparing polls to bets to models – indeed, it's one of the reasons why we do it – but it does have implications for a threshold

The acceptable band for a UK General Election on a four-party-forced basis is a MAE of 2%[0510e]. We considered using this threshold for our two-party-forced predictions, but the large vote for "others" in 2016 gave us pause, and it will not be included in the article