Election Forecasting

GRAD-E1234

Prediction Markets

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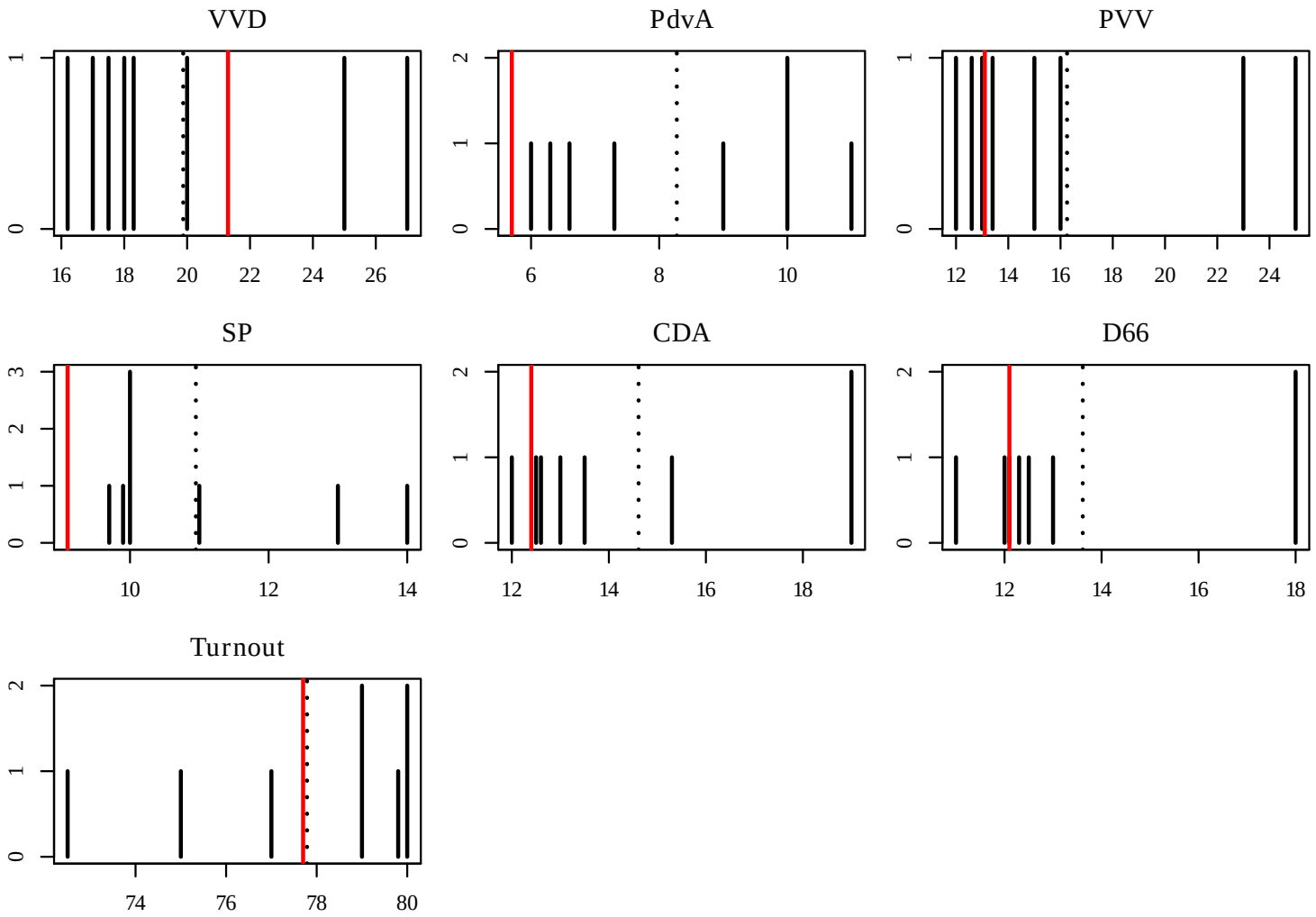
Spring Semester 2017
Hertie School of Governance

Session outline

Election forecast of last week

VVD	PdvA	PVV	SP	CDA	D66
21.30	5.70	13.10	9.10	12.40	12.10



Election forecast of last week

rank	respondent	mae	rmse	time
1	Akira Sasaki	1.07	1.40	20
2	Alexander Sacharow	1.27	1.57	30
3	Dennis Schmargon	1.31	1.62	15
4	Hendrik Frank	1.34	1.83	20
5	Moritz Hemmerlein	1.94	2.74	30
6	Nadina Iacob	2.20	2.55	20
7	Jeremie Bonnemort	5.66	6.41	5
8	Christoph Abels	5.93	6.20	15

rank	note
1	Picked seemingly 3 big pollsters in the Netherlands and weighted-averaged their most recent polls according to their numbers of respondents. The turnout rate is randomly guessed based on the past 2 elections.
2	Used the Ipsos poll and corrected if by the house bias it had during the last election. And a lot of time went on searching for percentage polls, which I could not find.
6	Evolution of polls; "gut feeling"
7	Mostly from the 3 most recent series of polling.

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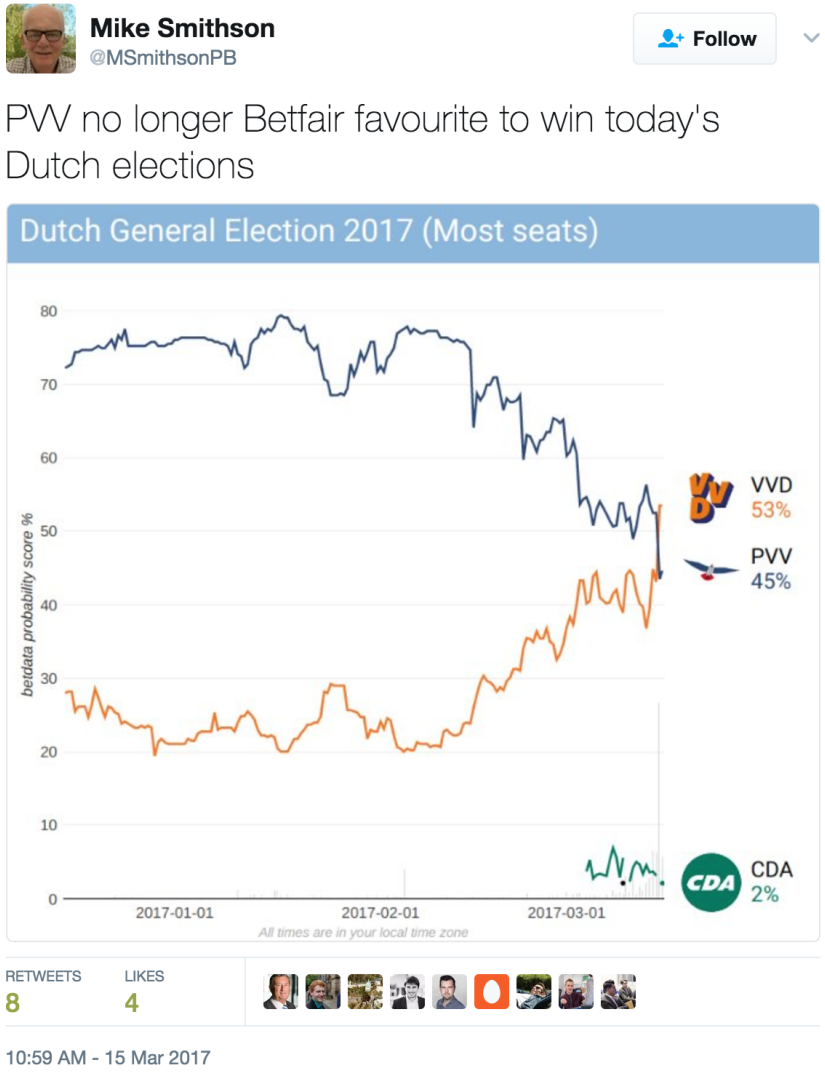
Election forecast of last week: polls performance

Seats [edit]

Poll results are listed in the tables below in reverse chronological order, showing the most recent first. The highest figure in each survey is displayed in bold, and the background shaded in the leading party's colour. In the instance that there is a tie, then both figures are shaded. In contrast with many countries, opinion poll results i Netherlands are generally reported in terms of the number of seats expected to be won rather than the percentage of the party vote (total is 150). Seat totals from the LISS panel are recorded separately in a section below, as it represents the trends among a static panel and is not a standard poll.

Date	Polling firm	VVD	PvdA	PVV	SP	CDA	D66	CU	GL	SGP	PvdD	50+	Oth.[2]	Lead
15 Mar 2017	Election result (prelim.)	**33**	9	20	14	19	19	5	14	3	5	4	5[3]	**13**
14 Mar 2017	TNS NIPO	**27**	11	23	15	20	18	6	14	3	4	6	3	**4**
14 Mar 2017	Ipsos	**29**	9	20	15	23	18	5	15	4	4	5	3	**6**
14 Mar 2017	Peil	**27**	9	24	13	22	15	5	18	3	4	4	6	**3**
14 Mar 2017	I&O Research	**27**	12	16	14	19	20	6	20	3	5	4	4	**7**
13 Mar 2017	Peil	**27**	9	24	14	21	16	5	19	3	4	4	4	**3**
13 Mar 2017	I&O Research	**24**	13	20	14	17	18	5	20	3	6	4	6	**4**
13 Mar 2017	De Stemming	**24**	10	**24**	16	21	16	7	16	3	5	5	3	**Tied**
12 Mar 2017	Peil	**24**	9	22	15	22	17	5	20	3	4	5	4	**2**
10 Mar 2017	Peil	**24**	9	22	15	22	17	5	20	3	4	5	4	**2**
9 Mar 2017	Ipsos	**26**	11	23	13	21	17	6	14	5	4	6	3	**3**
9 Mar 2017	TNS NIPO	**26**	12	24	15	17	21	6	14	3	3	6	3	**2**
8 Mar 2017	I&O Research	**24**	14	20	14	16	20	5	17	4	6	5	5	**4**
7 Mar 2017	Peil	**25**	9	23	14	21	17	5	18	3	5	5	5	**2**
6 Mar 2017	De Stemming	**24**	12	**24**	15	20	16	7	16	3	4	5	4	**Tied**
5 Mar 2017	Peil	24	10	**25**	13	21	17	5	17	3	5	5	5	1
3 Mar 2017	Peil	24	10	**25**	13	21	17	5	17	3	5	5	5	1
2 Mar 2017	Ipsos	**28**	12	24	12	19	17	6	13	5	5	6	3	**4**
28 Feb 2017	I&O Research	**25**	14	22	12	15	17	8	20	4	5	4	4	**3**
28 Feb 2017	Peil	25	12	**28**	11	19	15	5	17	3	4	6	5	3
27 Feb 2017	TNS NIPO	27	12	**28**	13	17	19	6	13	3	4	6	2	1
27 Feb 2017	De Stemming	**22**	12	**22**	16	19	17	7	15	4	7	5	4	**Tied**

Election forecast of last week: market performance



Prediction markets

How prediction markets work

Prediction markets...

- are markets for certain events
- provide infrastructure for interaction
- allow traders to bet on outcomes of certain events
- aggregate information
- generate payoffs that can be used as predictors of events

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Efficient-market hypothesis

- a market is efficient if the prices fully reflect all available information and nobody is able to beat the market consistently
- investors - buyers and sellers - behave rational on the basis of common information (can be relaxed)
- almost tautological: if market is truly efficient, it's the best predictor of events–better than any other combination of surveys or other information

How prediction markets work

Incentives in prediction markets

- information that is useful for forecasting gets rewarded if it's not already priced in
- provides incentives to look for more information
- payoffs are tied to outcomes (reflect expectations)
- wisdom-of-the-crowds effect in price formation

Types of prediction markets

Contract Types: Estimating Uncertain Quantities or Probabilities

Contract	*Example*	*Details*	*Reveals market expectation of . . .*
Winner-take-all	Event y: Al Gore wins the popular vote.	Contract costs $\$p$. Pays \$1 if and only if event y occurs. Bid according to value of $\$p$.	Probability that event y occurs, $p(y)$.
Index	Contract pays \$1 for every percentage point of the popular vote won by Al Gore.	Contract pays $\$y$.	Mean value of outcome y: $E[y]$.
Spread	Contract pays even money if Gore wins more than $y^*\%$ of the popular vote.	Contract costs \$1. Pays \$2 if $y > y^*$. Pays \$0 otherwise. Bid according to the value of y^*.	Median value of y.

Examples of election prediction markets and derivatives

- Prognosys Electronic Stock Markets, http://boerse.prognosys.de/
- Wahlfieber, http://www.wahlfieber.at/
- Good Judgment Open, https://www.gjopen.com/ (targeted at a variety of political events)
- PredictWise, http://predictwise.com (be sure to check out the German Politics section)

Making inferences from prediction markets

quantities that can be forecasted using prediction markets

- probability of event y
- mean value of result y, $E[y]$
- median value of y
- probability distribution of y using families of bets
- standard deviation using a market for y^2 because $\sigma_y = \sqrt{E(y^2) - E(y)^2}$
- joint probabilities using contingent markets
- implications of (added) information for probability of event y or value of y using market movements

Making inferences from prediction markets

Contingent Markets: 2004 Presidential Election

(contracts pay according to vote share, conditional on the Democratic nominee)

Contract Pays Conditional on Specific Democratic Candidate	*Democratic Candidate Vote Share (Contract Price, $)* A	*Republican Vote Share Against this Candidate (Contract Price, $)* B	*Implied Prob. this Candidate Wins Nomination* $C = A + B$	*Expected Share of Popular Vote if Nominated* $D = A/C$
John Kerry	$0.344	$0.342	68.6%	50.1%
John Edwards	$0.082	$0.066	14.8%	55.4%
Howard Dean	$0.040	$0.047	8.7%	46.0%
Wesley Clark	$0.021	$0.025	4.6%	45.7%
Other Democrats	$0.015	$0.017	3.2%	46.9%

Notes: Columns A and B show the prices of contracts that pay a penny for each percentage of the two-party popular vote won by Democrats or Republicans respectively, conditional on picking the winner of the Democratic nomination. (Contracts pay $0 if the selected candidate does not win the Democratic nomination.)

Source: Closing prices January 29, 2004, Iowa electronic markets.

Making inferences from prediction markets

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	$P(C \cap W)$	+	$P(C \cap \neg W)$	=	$P(C)$	$P(W \mid C) = P(C \cap W) / P(C)$
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Comparative performance

Schaffer/Schneider 2005

Tabelle 1: Wahlergebnis, realisierte Kurse und Umfragewerte sowie Wahlprognosen (Parteien)

	Ergebnis BTW 18.09.05	Wahlbörse 10.09.05	Wahlbörse 10.09.05 (Prognose)	Wahlbörse 17.09.05	Wahlbörse 17.09.05 (Prognose)	Wahlbörse 18.09.05 (Schlusskurs)	Emnid 13.09.05 (letzte Umfrage)	Forsa 16.09.05 (letzte Umfrage)
SPD	**34,3**	33,58	35,32[1]	33,41	33,51[6]	33,11	33,5	33,0
CDU	**35,2**	39,59	40,22[2]	40,66	40,39[7]	39,99	42,0	42,0
Grüne	**8,1**	8,14	8,11[3]	8,01	8,06[8]	7,84	7,0	6,5
FDP	**9,8**	7,40	7,48[4]	7,30	7,34[9]	9,70	6,5	7,5
Linkspartei	**8,7**	8,43	9,57[5]	7,75	8,53[10]	7,68	8,0	7,5
∅ quadrierter Fehler		**5,13**	**6,48**	**7,55**	**6,72**	**5,10**	**11,89**	**11,44**

Comparative performance

Rothschild 2009

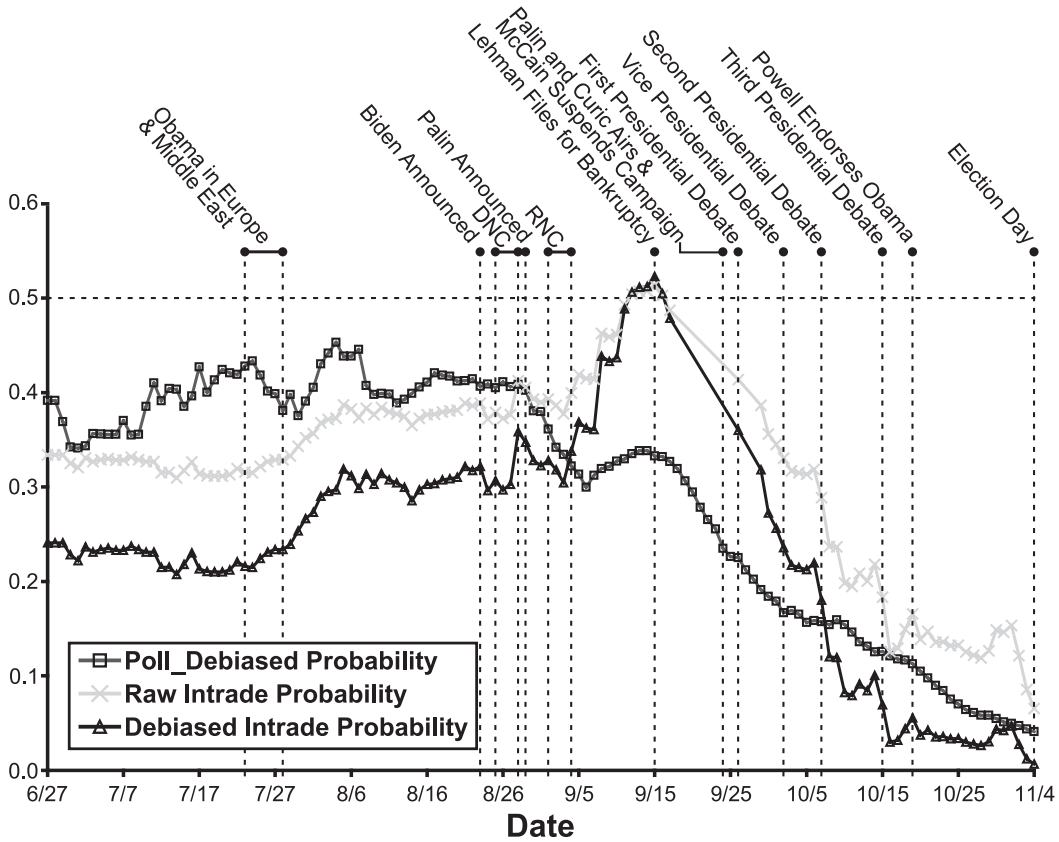

Figure 1. Probability of Victory in the National Popular Vote for the Incumbent Party Candidate in the 2008 Presidential Election.
NOTE.—The incumbent party candidate, Republican John McCain, lost by a margin of 7.4 percentage points in the votes cast for the two major party candidates.

Limitations and undesired properties

- favorite–long shot bias: bettors overvalue extreme long shots and undervalue favorites
  - risk-love, misperceptions of probabilities (Snowberg/Wolfers 2010)
- bias to trade according to desires
  - but: as long as marginal trades are motivated by profits not partisanship, priced should be unbiased
- speculative bubbles driving prices away from likely outcomes
  - candidates betting on themselves, too few participants ("thin market"), no real money at stake ("skin in the game"), but no clear evidence according to Wolfers/Zitzewitz 2004

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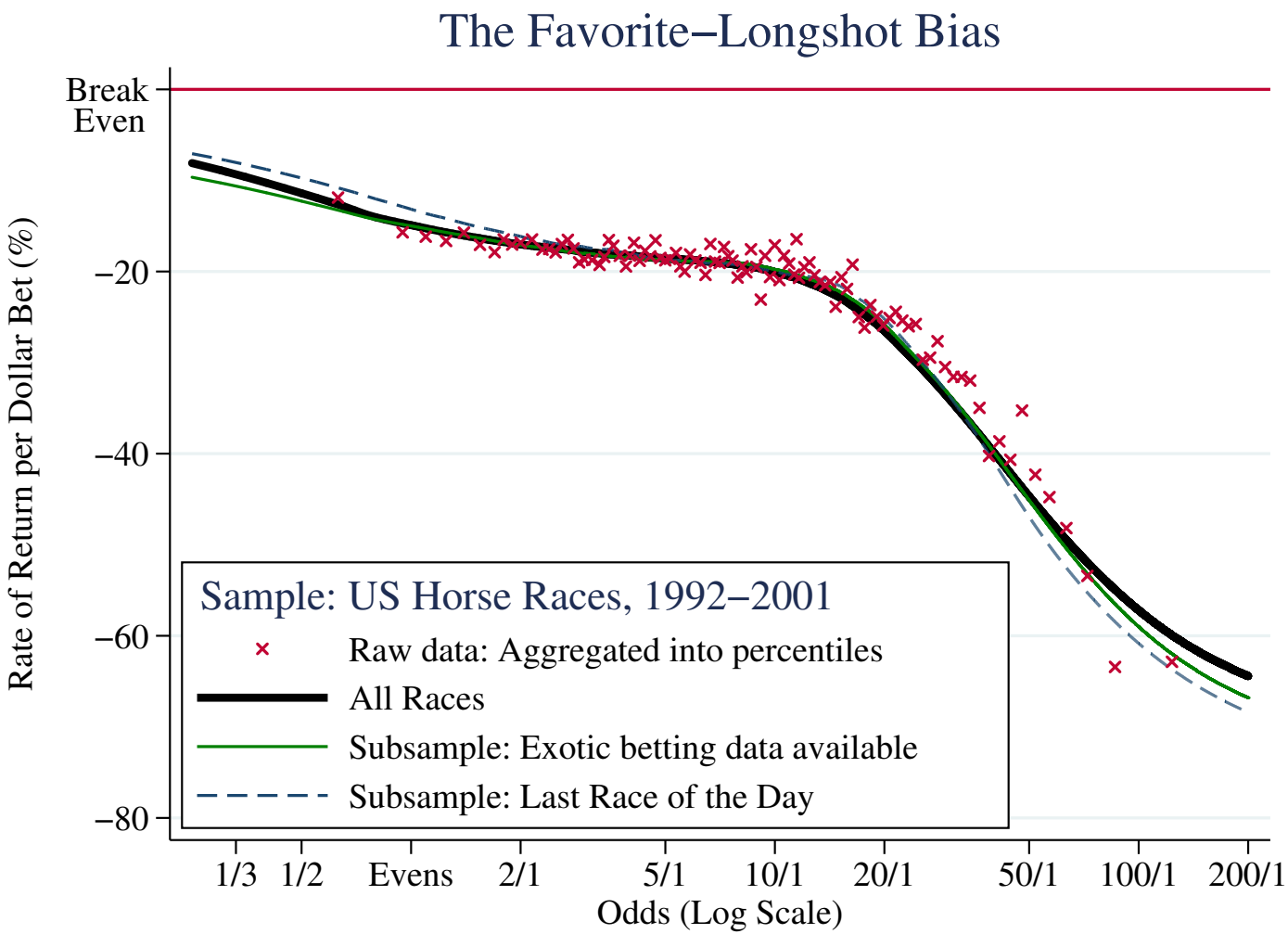
Value of prediction markets?

- provide incentives for truthful revelation, information discovery, and a mechanism to aggregate opinions
- but: markets per se do not guarantee that public information that is aggregated is informative, non-selective, accurate, un-biased

Favorite–long shot bias

Figure 1: The rate of return on win bets declines as risk increases.



Notes: Sample includes 5,610,580 horse race starts in the United States from 1992–2001. Lines reflect Lowess smoothing (bandwidth=0.4).

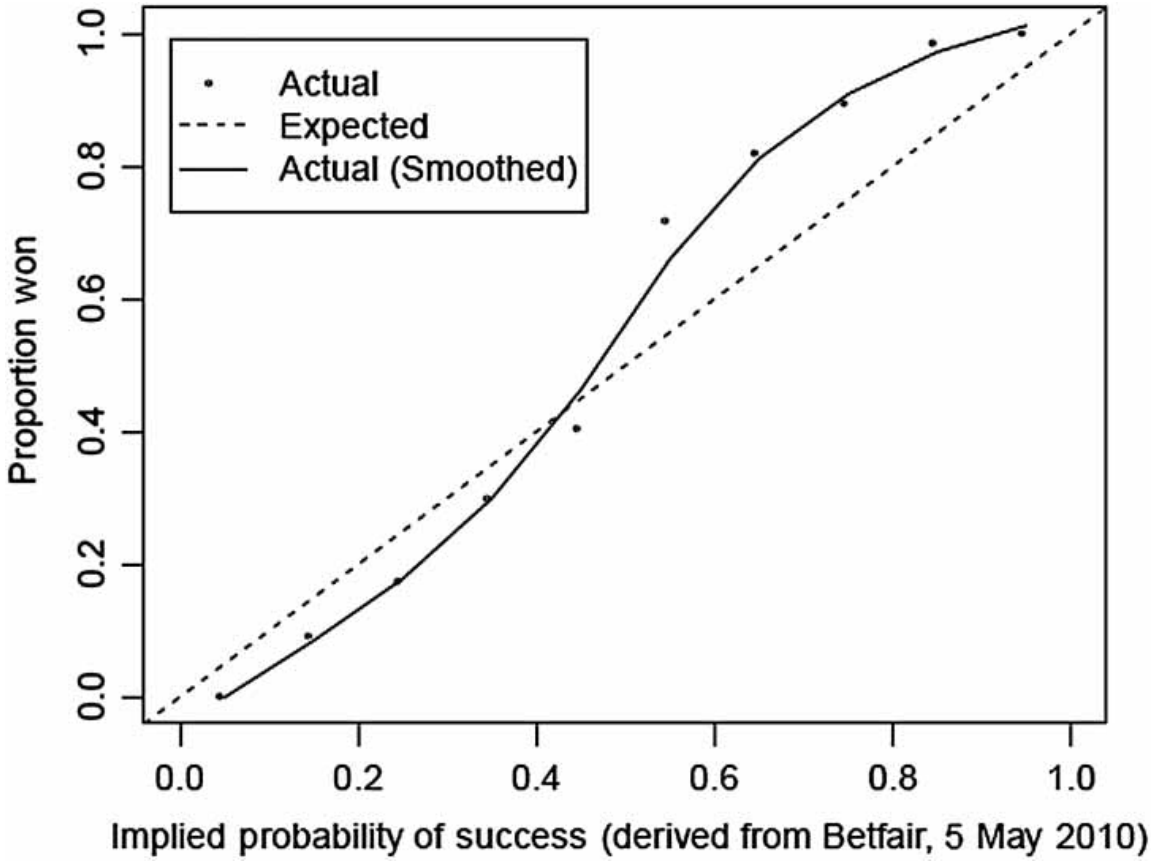
Favorite–long shot bias

Wall et al. 2012

Table 4. Proportions of winning candidates in UK 2010 election tabulated against implied probabilities derived from Betfair.com, 5 May 2010

Implied probability bracket	% win overall	Frequency win overall	% win Conservative	% win Labour	% win Lib-Dem
5% or less	0	0/1327	0	0	0
5–10%	0	2/368	0	4	0
11–20%	9	12/128	4	21	0
21–30%	17	21/121	17	42	0
31–40%	30	31/104	15	66	10
41–50%	41	28/69	4	83	29
51–60%	72	71/99	56	92	68
61–70%	82	95/116	82	100	54
71–80%	90	96/107	91	100	66
81–90%	98	306/311	98	100	87
More than 91%	100	30/30	100	100	100

Favorite–long shot bias



The favourite-long shot bias demonstrated. Comparing predicted the proportion of winners with the expected number of winners in each decile.

- implies possible solution to correct for favorite–long shot bias
- Leigh et al. (2002) suggest: $Pr_{corrected} = \Phi(1.64 * \Phi^{-1}(Pr_{raw}))$

Trading according to desires; bubbles

- Handelsblatt's "Economic Indicator eXchange"" (EIX) platform, active in advance of the 2013 German federal election
- seized by AfD trolls (misperception of probabilities? rather not)

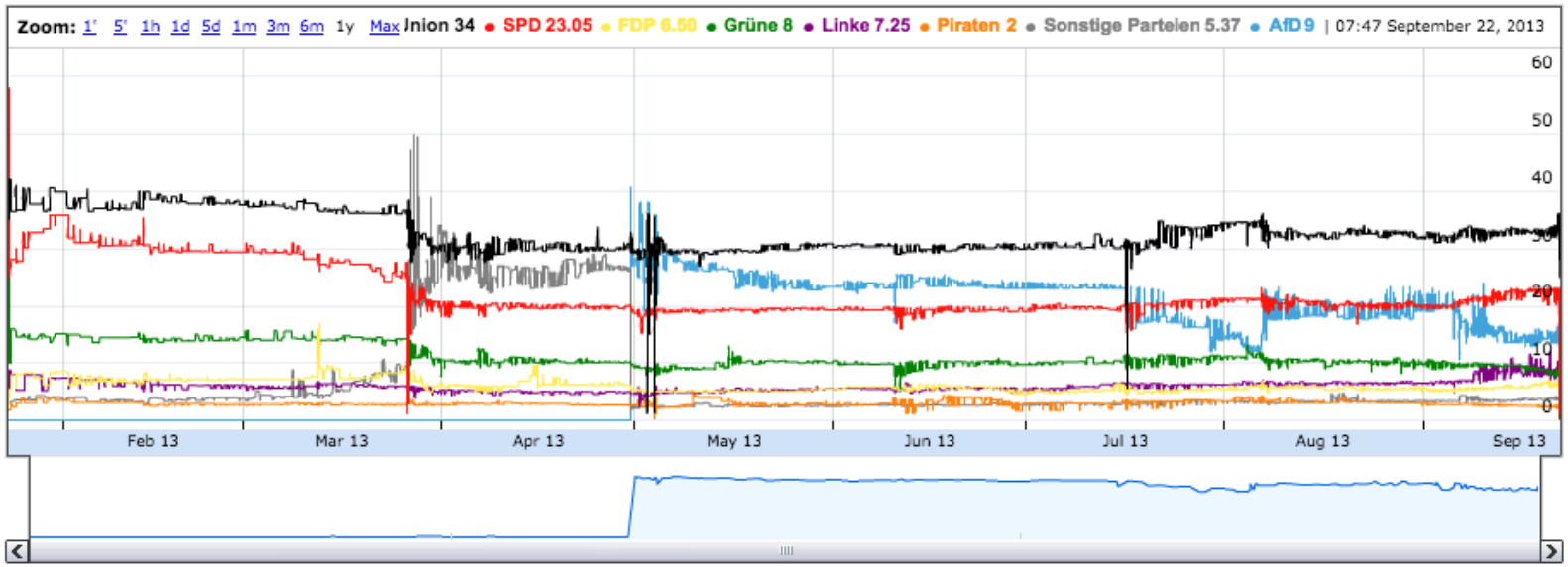
Prognosen (Gemittelte Preise, normiert; Differenzen in Klammern)

Zeitpunkt/Zeitraum	CDU	SPD	Grüne	LINKE	FDP	AfD	Piraten	Sonstige
Letzte 24h	35.06 % (-6.5)	20.32 % (-5.4)	8.47 % (-0.1)	7.63 % (-0.8)	6.70 % (+1.9)	15.15 % (+10.5)	2.53 % (+0.3)	4.15 % (+0.1)
Letzte 7 Tage	33.56 % (-8.0)	21.79 % (-4.0)	8.90 % (+0.3)	8.68 % (+0.2)	6.32 % (+1.6)	14.43 % (+9.7)	2.51 % (+0.3)	3.82 % (-0.2)
Letzte 14 Tage	33.22 % (-8.3)	21.75 % (-4.0)	8.71 % (+0.1)	8.98 % (+0.5)	6.08 % (+1.3)	15.33 % (+10.6)	2.56 % (+0.4)	3.37 % (-0.7)
Letzten Monat	32.61 % (-8.9)	20.86 % (-4.9)	7.99 % (-0.6)	9.41 % (+1.0)	5.73 % (+1.0)	17.17 % (+12.5)	2.69 % (+0.5)	3.54 % (-0.5)

Gebote abgegeben: 47.262

Trading according to desires; bubbles

Partei



Kandidat

Outlook: French election 2017

- how are the odds? http://www.oddschecker.com/politics/european-politics/french-election/next-president
- how do odds relate to probabilities? http://www.bettingexpert.com/how-to/convert-odds
- what do the polls tell us? https://en.wikipedia.org/wiki/Opinion_polling_for_the_French_presidential_election,_2017
- let's earn some money! e.g., https://www.bet365.com

Models based on citizens' expectations

Murr (2011)

- what does Condorcet's Jury Theorem imply?
- why and under what conditions should groups be able to be better at forecasting elections than individuals?
- should surveys poll expectations rather than vote intentions?
- what are the benefits of local-level forecasts?
- according to Murr (2011), which factors are associated with the performance of group-based forecasts?

Murr (2011)

Performance of individual and aggregated predictions of which party will win in the constituency.

	Individual level		Constituency level			
			Plurality voting		Range voting	
	N	in %	N	in %	N	in %
Missing/no clear answer	3389	20.2	11	1.8	–	–
Incorrect	4114	24.6	79	12.6	88	14.0
Correct	9220	55.1	537	85.7	539	86.0
Total	16,723	100.0	627	100.0	627	100.0

Note: Results are based on the pre-election internet survey of the 2010 British Election Study. Results are only computed for the 627 constituencies that were won by one of the 'main' five parties—Conservatives, Labour, Liberal Democrats, Plaid Cymru and the Scottish National Party. The individual level results are based on responses to the question "On a scale that runs from 0 to 10, where 0 means very unlikely and 10 means very likely, how likely is it that [the name of the party] will win the election in your local constituency?" for each party. Those that did not

Murr (2011)

Explaining correct group predictions. Logistic regression model with variables relating to "task difficulty" and "group characteristics".

	Estimate	Std. Error
(Intercept)	−2.27	(4.19)
TASK DIFFICULTY		
Boundary change	0.01	(0.01)
Margin	0.18[a]	(0.02)
Abs. change in turnout	0.02	(0.05)
Size of electorate	−0.24	(0.20)
Number of parties	−0.10	(0.19)
GROUP CHARACTERISTICS		
Decision making		
Group Size	0.08[a]	(0.03)
Informational diversity		
Education	0.26	(0.74)
Interest	0.67	(0.85)
Attention	−0.43	(0.87)
Newspaper	−0.94	(1.73)
Response date	1.21[a]	(0.42)
Sociological diversity		
Age	0.05	(0.06)
Female	−1.57	(3.66)
Income	−0.02	(0.77)
N	627	
AIC	393.09	
BIC	659.55	
log *L*	−136.55	
Area under ROC curve	86.3%	

[a] Significance at $p < 0.05$; Standard errors in parentheses.

Partisan bias in expectation surveys

Table 1.
Relation between preference and expectation in U.S. presidential elections[a]

Year	Democrat/Republican	Respondents intending to vote Democratic who expect Democrat to win (%)	Respondents intending to vote Republican who expect Republican to win (%)	Who prefer and expect the same candidate to win (%)
1996	Clinton/Dole	99.1	25.6	72
1992	Clinton/Bush	87.5	69.0	80
1988	Dukakis/Bush	51.7	94.2	74
1984	Mondale/Reagan	28.8	99.0	71
1980	Carter/Reagan	87.0	80.4	84
1976	Carter/Ford	84.2	80.6	82
1972	McGovern/Nixon	24.7	99.6	77
1968	Humphrey/Nixon	62.5	95.4	81
1964	Johnson/Goldwater	98.6	30.5	81
1960	Kennedy/Nixon	78.4	84.2	81
1956	Stevenson/Eisenhower	54.6	97.6	80
1952	Stevenson/Eisenhower	81.4	85.9	84

a Source: Granberg and Brent (1983) who use survey data collected by the Survey Research Center/Center for Political Studies of the University of Michigan. Entries for 1984, 1988 and 1992 were obtained from correspondence with Professor Granberg. Entries for 1996 were constructed directly from Survey Research Center/Center for Political Studies American National Election Survey data.

Discussion

Discussion

Question 1

How is information induced into forecasts / activity of election forecasting markets? Could these markets work without polls?

Question 2

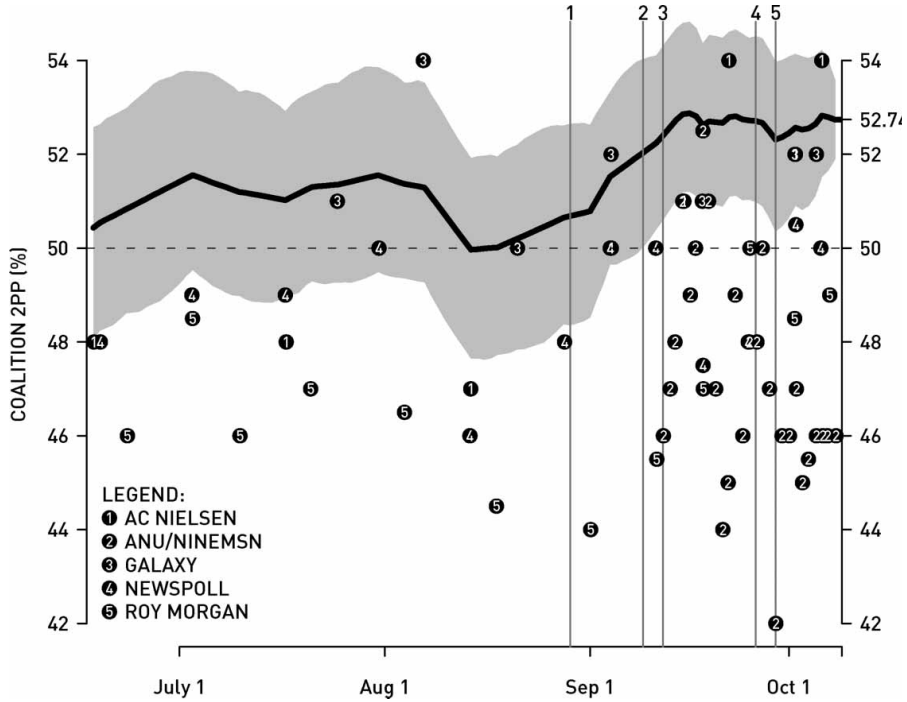
Which role does the sample of participants play for the performance of a prediction market?

Notes

- 60 minutes time
- 30 questions
- mix of open and closed questions
- you have to provide some easy calculations (contrary to previous advice, **bring your calculators!**)
- please come early! exam starts at 10a.m., please be there at 9.45am

Exam questions: examples

1. Consider the following graph! What does the solid black line represent?



- ❒ a simple average of individual vote intention polls (black dots)
- ❒ a rolling average of individual vote intention polls (black dots)
- ❒ levels of party support estimated from polls and correcting for institute-specific bias
- ❒ temperature curve in Sydney, Australia
- ❒ decrease in uncertainty about vote intentions over the course of an election campaign
- ❒ prediction market performance vs. polls (black dots)

Exam questions: examples

2. Which of the following are among the criteria that go into the Lewis-Beck index that helps judge the quality of an election forecasting instrument?

- ❒ accuracy
- ❒ parsimony
- ❒ uncertainty
- ❒ reproducibility
- ❒ quantity of historical data
- ❒ historical performance

Exam questions: examples

3. Summarize the rationale of wisdom-of-the-crowds approaches in election forecasting in your own words (3 sentences max.)!

See you next week!