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Predictive Bookmaker Consensus Model for the UEFA Euro 2016

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Abstract

From 10 June to 10 July 2016 the best European football teams will meet in France to determine the European Champion in the UEFA European Championship 2016 tournament (Euro 2016 for short). For the first time 24 teams compete, expanding the format from 16 teams as in the previous five Euro tournaments. For forecasting the winning probability of each team a predictive model based on bookmaker odds from 19 online bookmakers is employed. The favorite is the host France with a forecasted winning probability of 21.5%, followed by the current World Champion Germany with a winning probability of 20.1%. The defending European Champion Spain follows after some gap with 13.7% and all remaining teams are predicted to have lower chances with England (9.2%) and Belgium (7.7%) being the “best of the rest”.

Furthermore, by complementing the bookmaker consensus results with simulations of the whole tournament, predicted pairwise probabilities for each possible game at the Euro 2016 are obtained along with “survival” probabilities for each team proceeding to the different stages of the tournament. For example, it can be determined that it is much more likely that top favorites France and Germany meet in the semifinal (7.8%) rather than in the final at the Stade de France (4.2%) – which would be a re-match of the friendly game that was played on 13 November 2015 during the terrorist attacks in Paris and that France won 2-0. Hence it is maybe better that the tournament draw favors a match in the semifinal at Marseille (with an almost even winning probability of 50.5% for France). The most likely final is then that either of the two teams plays against the defending champion Spain with a probability of 5.7% for France vs. Spain and 5.4% for Germany vs. Spain, respectively.

All forecasts are the result of an aggregation of quoted winning odds for each team in the Euro 2016: These are first adjusted for profit margins (“overrounds”), averaged on the log-odds scale, and then transformed back to winning probabilities. Moreover, team abilities (or strengths) are approximated by an “inverse” procedure of tournament simulations, yielding estimates of probabilities for all possible pairwise matches at all stages of the tournament. This technique correctly predicted the winner of the FIFA 2010 and Euro 2012 tournaments while missing the winner but correctly predicting the final for the Euro 2008 and three out of four semifinalists at the FIFA 2014 World Cup (Leitner, Zeileis, and Hornik 2008, 2010a,b; Zeileis, Leitner, and Hornik 2012, 2014).

Keywords: consensus, agreement, bookmakers odds, tournament, UEFA European Championship 2016.

1. Bookmaker consensus

In order to forecast the winner of the Euro 2016, we obtained long-term winning odds from 19 online bookmakers (see Table 3 at the end). However, before these odds can be transformed to winning probabilities, the stake has to be accounted for and the profit margin of the bookmaker (better known as the “overround”) has to be removed (for further details see Henery 1999; Forrest, Goddard, and Simmons 2005). Here, it is assumed that the quoted odds are derived from the underlying “true” odds as: $quoted\ odds = odds \cdot \delta + 1$, where +1 is the stake (which is to be paid back to the bookmakers’ customers in case they win) and $\delta < 1$ is the proportion of the bets that is actually paid out by the bookmakers. The overround is the remaining proportion $1 - \delta$ and the main basis of the bookmakers’ profits (see also Wikipedia 2016 and the links therein). Assuming that each bookmaker’s δ is constant across the various teams in the tournament (see Leitner *et al.* 2010a, for all details), we obtain overrounds for all 19 bookmakers with a median value of 15.1%.

To aggregate the overround-adjusted odds across the 19 bookmakers, we transform them to the log-odds (or logit) scale for averaging (as in Leitner *et al.* 2010a). The bookmaker consensus is computed as the mean winning log-odds for each team across bookmakers (see column 4 in Table 1) and then transformed back to the winning probability scale (see column 3 in Table 1). Figure 1 shows the barchart of winning probabilities for all 24 competing teams.

According to the bookmaker consensus model, France is most likely to take a home victory (with probability 21.5%) followed by the current FIFA World Champion Germany (with probability 20.1%). The only other team with a double-digit winning probability is the defending European Champion Spain (with 13.7%), followed by England (with 9.2%) and Belgium (with 7.7%) who both demonstrated the potential for surprises in the qualification phase and recent friendly matches. All remaining teams have winning probabilities below 5%. As researchers from Austrian universities, we happily point out that the Austrian team ranks 9th out of 24 teams in terms of the predicted winning probability, reflecting the very successful qualification phase. However, the absolute probability is fairly low with only 2.3%.

Although forecasting the winning probabilities for the Euro 2016 is probably of most interest, we continue to employ the bookmakers’ odds to infer the contenders’ relative abilities (or strengths) and the expected course of the tournament. To do so, an “inverse” tournament

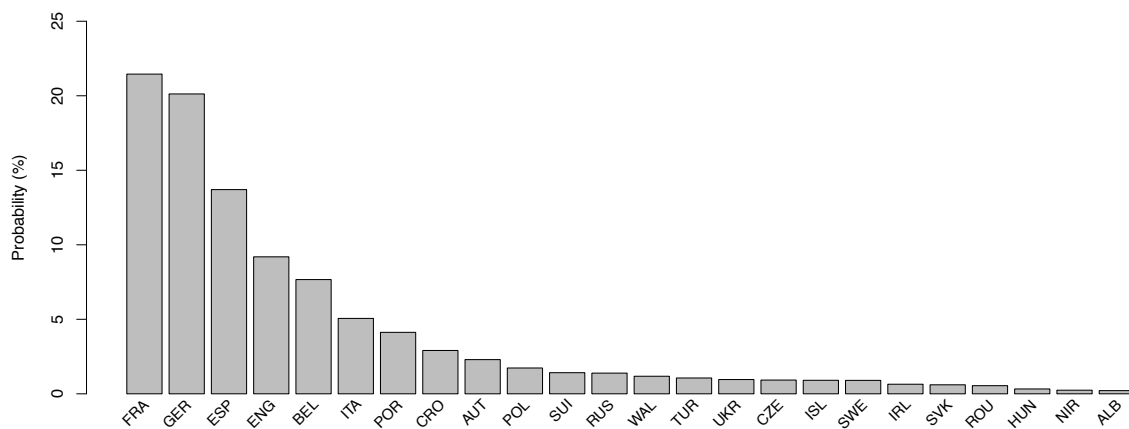


Figure 1: Euro 2016 winning probabilities from the bookmaker consensus model.

Team	FIFA code	Probability	Log-odds	Log-ability	Group
France	FRA	21.5	-1.298	-1.748	A
Germany	GER	20.1	-1.379	-1.766	C
Spain	ESP	13.7	-1.840	-2.001	D
England	ENG	9.2	-2.290	-2.209	B
Belgium	BEL	7.7	-2.489	-2.261	E
Italy	ITA	5.1	-2.932	-2.393	E
Portugal	POR	4.1	-3.146	-2.538	F
Croatia	CRO	2.9	-3.508	-2.633	D
Austria	AUT	2.3	-3.751	-2.771	F
Poland	POL	1.7	-4.038	-2.892	C
Switzerland	SUI	1.4	-4.242	-2.985	A
Russia	RUS	1.4	-4.262	-2.929	B
Wales	WAL	1.2	-4.429	-3.004	B
Turkey	TUR	1.1	-4.535	-2.915	D
Ukraine	UKR	1.0	-4.638	-3.014	C
Czech Republic	CZE	0.9	-4.676	-2.953	D
Iceland	ISL	0.9	-4.693	-3.033	F
Sweden	SWE	0.9	-4.699	-2.985	E
Republic of Ireland	IRL	0.6	-5.040	-3.108	E
Slovakia	SVK	0.6	-5.102	-3.164	B
Romania	ROU	0.5	-5.204	-3.245	A
Hungary	HUN	0.3	-5.724	-3.300	F
Northern Ireland	NIR	0.2	-6.016	-3.406	C
Albania	ALB	0.2	-6.141	-3.471	A

Table 1: Bookmaker consensus model for the Euro 2016, obtained from 19 online bookmakers. For each team, the consensus winning probability (in %), corresponding log-odds, simulated log-abilities, and group in tournament is provided.

simulation based on team-specific abilities is used. The idea is the following:

1. If team abilities are available, pairwise winning probabilities can be derived for each possible match (see Section 2).
2. Given pairwise winning probabilities, the whole tournament can be easily simulated to see which team proceeds to which stage in the tournament and which team finally wins.
3. Such a tournament simulation can then be run sufficiently often (here 100,000 times) to obtain relative frequencies for each team winning the tournament.

Here, we use the iterative approach of [Leitner *et al.* \(2010a\)](#) to find team abilities so that the resulting simulated winning probabilities (from 100,000 runs) closely match the bookmaker consensus probabilities. This allows to strip the effects of the tournament draw (with weaker/easier and stronger/more difficult groups), yielding the log-ability measure (on the log-odds scale) in Table 1.

2. Pairwise comparisons

A classical approach to modeling winning probabilities in pairwise comparisons (i.e., matches between teams/players) is that of [Bradley and Terry \(1952\)](#) similar to the Elo rating ([Elo 2008](#)), popular in sports. The Bradley-Terry approach models the probability that a Team A beats a Team B by their associated abilities (or strengths):

$$\Pr(A \text{ beats } B) = \frac{\text{ability}_A}{\text{ability}_A + \text{ability}_B}.$$

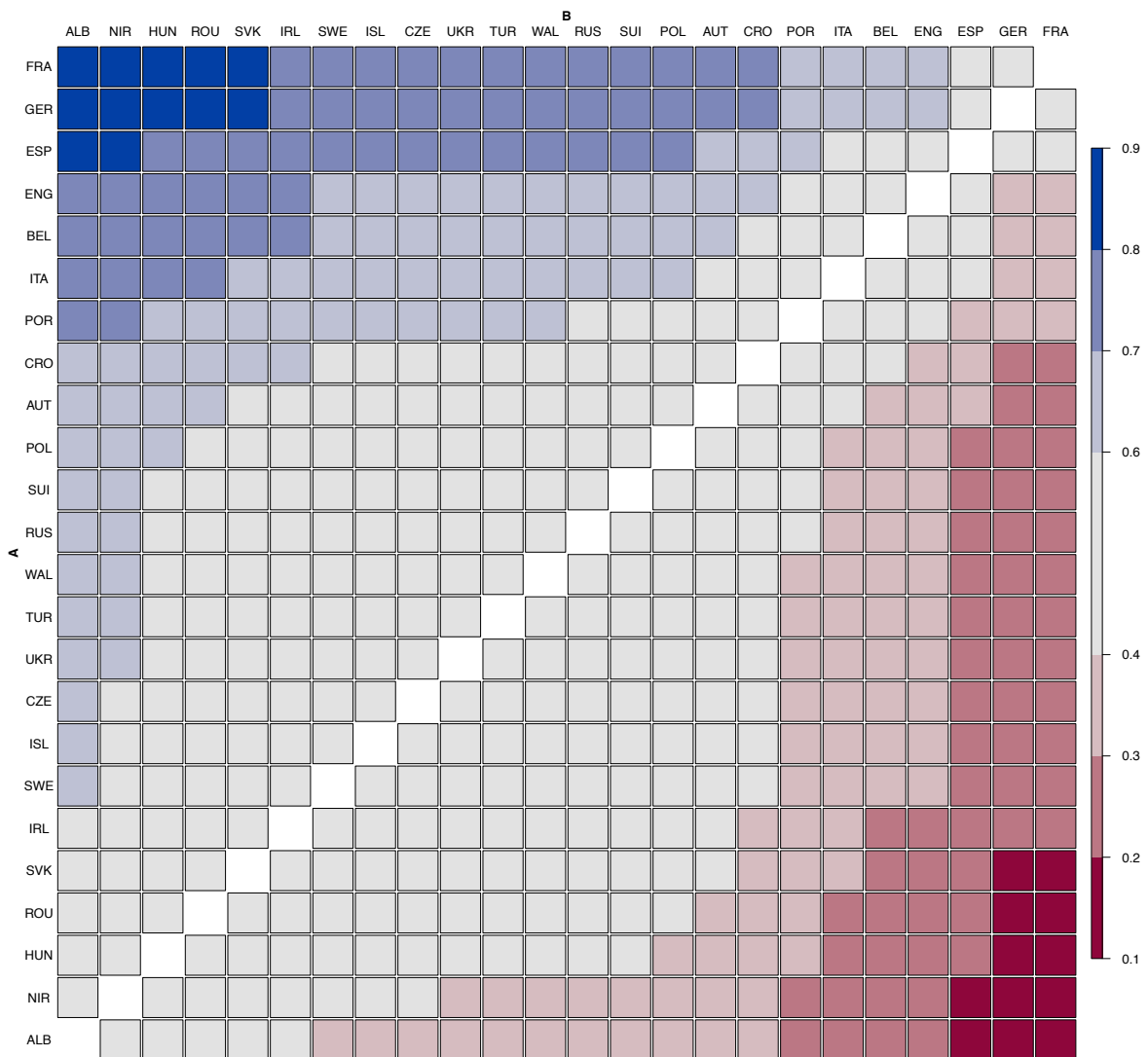


Figure 2: Winning probabilities in pairwise comparisons of all Euro 2016 teams. Light gray signals that either team is almost equally likely to win a match between Teams A and B (probability between 40% and 60%). Light, medium, and dark blue/red corresponds to small, moderate, and high probabilities of winning/losing a match between Team A and Team B .

As explained in Section 1, the abilities for the teams in the Euro 2016 can be chosen such that when simulating the whole tournament with these pairwise winning probabilities $\Pr(A \text{ beats } B)$, the resulting winning probabilities for the whole tournament are close to the bookmaker consensus winning probabilities. Table 1 reports the log-abilities for all teams and the corresponding pairwise winning probabilities are visualized in Figure 2.

Clearly, the bookmakers perceive France and Germany to be the strongest teams in the tournament that are almost on par (with a probability of only 50.5% that France beats Germany) while having moderate (70–80%) to high ($> 80\%$) probabilities to beat almost any other team in the tournament. The only group of teams that get close to having even chances are Spain (with probability of 43.7% and 44.2% of beating France and Germany, respectively), England (with 38.7% and 39.1%), and Belgium (with 37.4% and 37.9%). Behind these two groups of the strongest teams there are several larger clusters of teams that have approximately the same strength (i.e., yielding approximately even chances in a pairwise comparison). Interestingly, two of the teams with very low strengths (Romania and Albania) compete in the same group A together with the favorite team France.

3. Performance throughout the tournament

Based on the teams’ inferred abilities and the corresponding probabilities for all matches from Section 2 the whole tournament is simulated 100,000 times. As expounded above, the abilities have been calibrated such that the simulated winning proportions for each time closely match the bookmakers’ consensus winning probabilities. So with respect to the probabilities of winning the tournament, there are no new insights. However, the simulations also yield simulated probabilities for each team to “survive” over the tournament, i.e., proceed from the group-phase to the round of 16, quarter- and semifinals, and the final.

Figure 3 depicts these “survival” curves for all 24 teams within the groups they were drawn in. France and Germany are the clear favorites within their respective groups A and C with almost 100% probability to make it to the round of 16 and also rather small drops in probability to proceed through the subsequent rounds. All remaining teams have much poorer chances to proceed to the later stages of the Euro 2016. Group B also has a rather clear favorite with England and all remaining teams following with a certain gap. In contrast, groups D and E each have a favorite (Spain and Belgium, respectively) but with a second strong contender (Croatia and Italy, respectively). Group F is a weaker group but much more balanced compared with the previous groups. Due to the new tournament system where 16 out of 24 teams proceed from the group phase to the next stage, even the weakest teams have probabilities of about 40% to reach at least the round of 16. However, many of these weak teams then have rather poor chances to make it to the quarterfinals resulting in clear downward kinks in the survival curves. (See also Table 2 for the underlying numeric values.)

To emphasize that stronger and weaker teams are not evenly distributed across the different groups, Figure 4 tries to capture the group strength. More precisely, the average log-ability of the three teams without the groups’ favorite are shown relative to the median team’s log-ability. This brings out that especially France but also Germany have been drawn in groups with relatively weak contenders while it will be harder to prevail in groups D and E.

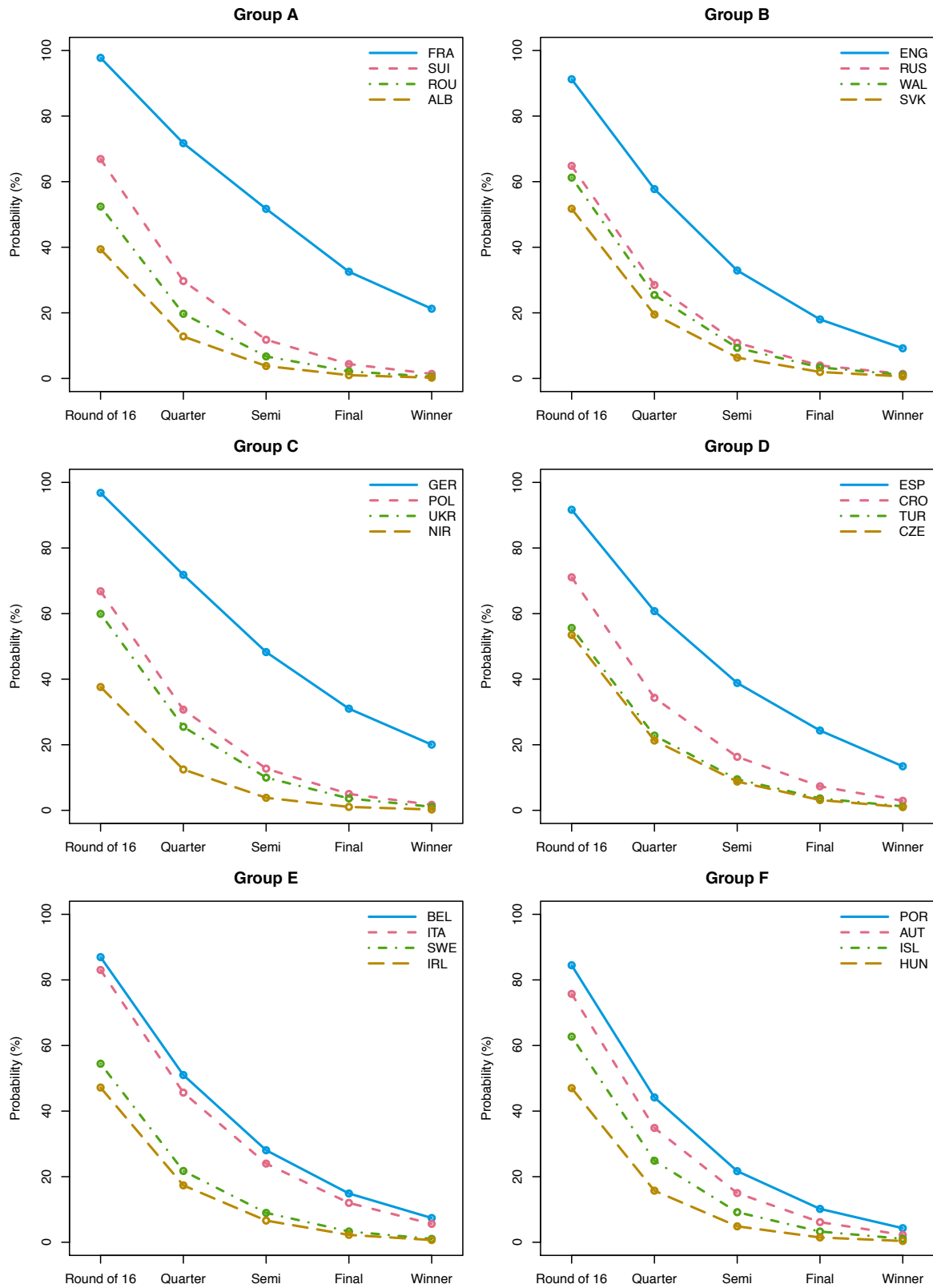


Figure 3: Probability for each team to “survive” in the Euro 2016, i.e., proceed from the group phase to the round of 16, quarter- and semifinals, the final and to win the tournament.

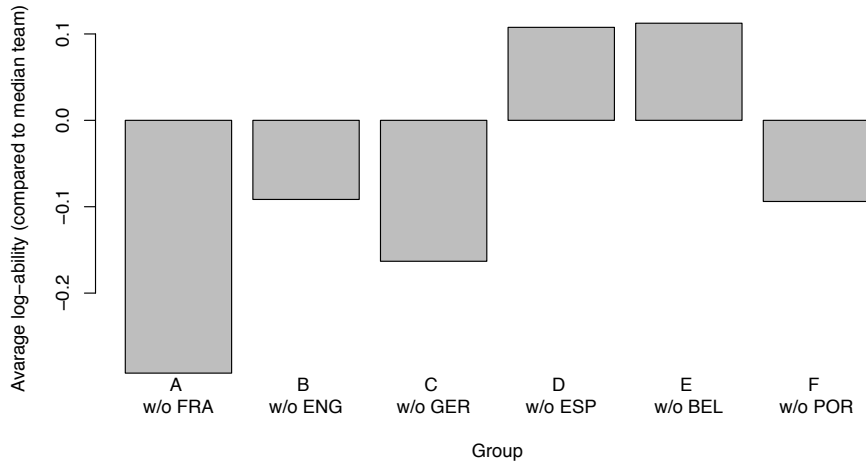


Figure 4: Group strengths. Average log-ability within each group, excluding the group favorite and centered by median log-ability across all teams.

4. Conclusions

Our forecasts for the Euro 2016 follow closely our previous studies in [Leitner *et al.* \(2008, 2010b\)](#) and [Zeileis *et al.* \(2012, 2014\)](#) which correctly predicted the winner of the FIFA 2010 and Euro 2012 tournaments. While missing the winner for Euro 2008 and the FIFA 2014 World Cup, the correct final (Euro 2008) and three out of four semifinalists (FIFA 2014 World Cup) were predicted in these tournaments. The core idea as established in [Leitner *et al.* \(2010a\)](#) is to use the expert knowledge of international bookmakers. These have to judge all possible outcomes in a sports tournament such as the UEFA European Championship and assign odds to them. Doing a poor job (i.e., assigning too high or too low odds) will cost them money. Hence, in our forecasts we solely rely on the expertise of 19 such bookmakers. Specifically, we (1) adjust the quoted odds by removing the bookmakers’ profit margins (with median value of 15.1%), (2) aggregate and average these to a consensus rating, and (3) infer the corresponding tournament-draw-adjusted team abilities using a classical pairwise-comparison model.

Not surprisingly, our forecasts are closely related to other rankings of the teams in the Euro 2016, notably the FIFA and Elo ratings. The Spearman rank correlation of the consensus log-abilities with the FIFA rating is 0.653 and with the Elo rating even 0.896. However, the bookmaker consensus model allows for various additional insights, such as the “survival” probabilities over the course of the tournament. Interestingly, when looking at the scatter plot of consensus log-abilities vs. the Elo rating in [Figure 5](#) there are a few teams that are either clearly better (above the dotted least-squares regression line, e.g., Wales) or worse (below the dotted line, e.g., Portugal or Ukraine) in the forward-looking bookmakers’ odds compared to the retrospective Elo rating.

Needless to say, of course, that all predictions are in probabilities that are far from being certain (i.e., much lower than 100%). While France taking the home victory is the most likely event in the bookmakers’ expert opinions, it is still far more likely that one of the other teams

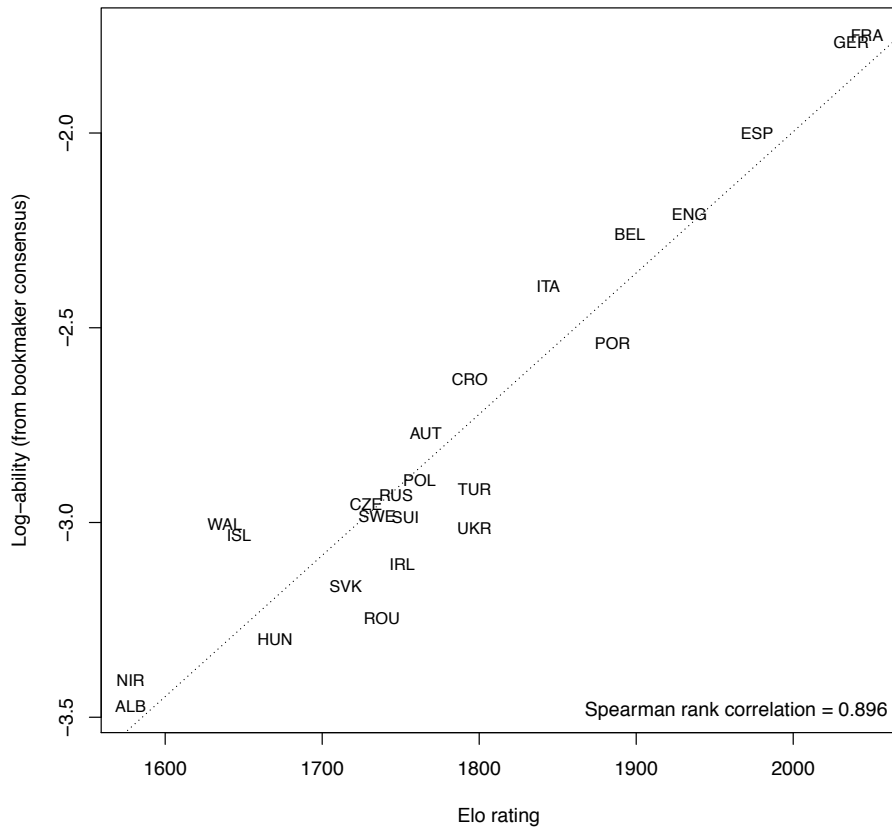


Figure 5: Bookmaker consensus log-ability vs. Elo rating for all 24 teams in the Euro 2016 (along with least-squares regression line).

wins. This is one of the two reasons why we would recommend to refrain from placing bets based on our analyses. The more important second reason, though, is that the bookmakers have a sizeable profit margin of about 15.1% which assures that the best chances of making money based on sports betting lie with them. Hence, this should be kept in mind when placing bets. We, ourselves, will not place bets but focus on enjoying the exciting football tournament that the UEFA European Championship 2016 will be with 100% predicted probability!

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Team	Round of 16	Quarterfinal	Semifinal	Final	Win
France	97.8	71.7	51.7	32.5	21.2
Germany	96.8	71.8	48.3	31.0	20.0
Spain	91.7	60.7	38.8	24.3	13.4
England	91.2	57.7	32.9	18.0	9.2
Belgium	86.9	51.0	28.1	14.9	7.4
Italy	83.0	45.6	24.0	12.0	5.6
Portugal	84.5	44.2	21.7	10.2	4.3
Croatia	71.1	34.3	16.3	7.3	2.9
Austria	75.7	34.9	15.0	6.1	2.3
Poland	66.8	30.7	12.7	5.0	1.7
Switzerland	66.9	29.7	11.8	4.4	1.4
Russia	64.8	28.5	10.8	3.9	1.4
Wales	61.2	25.4	9.3	3.4	1.1
Turkey	55.6	22.8	9.5	3.6	1.2
Ukraine	59.9	25.5	10.0	3.6	1.1
Czech Republic	53.5	21.3	8.8	3.1	1.0
Iceland	62.7	24.9	9.2	3.3	1.1
Sweden	54.4	21.7	9.0	3.3	1.0
Republic of Ireland	47.2	17.4	6.6	2.3	0.7
Slovakia	51.7	19.5	6.3	2.0	0.6
Romania	52.4	19.7	6.7	2.2	0.5
Hungary	47.0	15.7	4.9	1.5	0.4
Northern Ireland	37.6	12.5	3.8	1.0	0.3
Albania	39.4	12.8	3.8	1.0	0.2

Table 2: Simulated probability for each team to “survive” in the Euro 2016, i.e., proceed from the group phase to the round of 16, quarter- and semifinals, the final and to win the tournament.

	FRA	GER	ESP	ENG	BEL	ITA	POR	CRO	AUT	POL	SUI	RUS
bwin	4.33	4.30	6.5	9.0	12	15	21	26	34	51	67	67
10Bet	4.20	4.20	6.0	9.0	11	18	21	36	41	51	66	71
32Red	4.30	4.30	6.5	9.5	11	18	23	34	34	51	71	76
Bet365	4.33	4.33	6.5	9.5	12	17	21	34	41	51	67	67
Betfred	4.00	4.33	6.5	10.0	11	17	21	29	41	51	67	67
BetVictor	4.00	4.33	6.5	9.0	11	17	21	34	41	51	67	67
Boylesports	4.33	4.33	7.0	11.0	10	15	19	29	51	51	67	67
ComeOn	4.20	4.20	6.0	9.0	11	18	21	36	23	51	66	71
Coral	3.75	5.00	5.5	9.5	12	19	23	23	41	51	51	41
Gentingbet	4.00	4.50	6.5	9.0	11	17	21	29	34	41	51	51
Ladbrokes	4.33	4.50	6.5	9.5	11	17	17	29	34	51	51	41
Marathonbet.co.uk	4.00	4.00	6.5	9.0	12	15	21	34	34	51	51	51
PaddyPower	4.50	4.50	6.5	9.0	12	17	15	26	41	41	51	41
Spreadex	4.00	4.50	6.0	9.5	11	17	23	23	51	41	41	67
StanJames	4.00	4.33	6.5	10.0	11	17	21	21	34	51	67	67
totesport	4.00	4.33	6.5	10.0	11	17	21	29	41	51	67	67
Unibet	4.30	4.30	6.5	9.5	11	18	23	34	34	51	71	76
WilliamHill	4.00	4.50	6.5	9.0	12	17	21	26	34	51	51	67
youwin	3.75	4.50	6.0	9.0	11	17	23	34	34	51	67	67
	WAL	TUR	UKR	CZE	ISL	SWE	IRL	SVK	ROU	HUN	NIR	ALB
bwin	67	81	101	81	81	101	151	151	151	251	301	501
10Bet	71	81	81	81	101	101	121	101	80	101	134	501
32Red	81	81	81	101	91	101	151	151	251	401	501	501
Bet365	67	81	81	81	101	101	151	151	176	351	351	501
Betfred	81	81	101	101	101	101	126	151	126	251	501	501
BetVictor	67	81	101	101	101	101	151	151	201	351	351	501
Boylesports	51	81	67	67	67	67	81	101	101	151	301	301
ComeOn	71	81	81	81	101	101	121	101	80	101	134	101
Coral	81	81	51	126	126	67	126	151	201	301	301	251
Gentingbet	67	81	126	81	151	101	151	151	201	251	501	501
Ladbrokes	81	67	81	101	81	101	151	151	151	251	301	251
Marathonbet.co.uk	61	81	81	101	61	81	126	151	126	251	501	401
PaddyPower	81	81	101	126	101	101	101	151	151	401	501	501
Spreadex	81	101	101	101	101	81	201	201	201	301	301	401
StanJames	81	81	101	81	81	101	151	101	251	351	501	501
totesport	81	81	101	101	101	101	126	151	126	251	501	501
Unibet	81	81	81	101	91	101	151	151	251	401	501	501
WilliamHill	67	67	101	67	81	101	101	151	151	251	251	301
youwin	67	81	101	101	101	101	126	151	151	351	401	501

Table 3: Quoted odds from 19 online bookmakers for the 24 teams in the Euro 2016. Obtained on 2016-05-22 from <http://www.oddscomparisons.com/> and <http://www.bwin.com/>, respectively.

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Predictive bookmaker consensus model for the UEFA Euro 2016

Abstract

From 10 June to 10 July 2016 the best European football teams will meet in France to determine the European Champion in the UEFA European Championship 2016 tournament (Euro 2016 for short). For the first time 24 teams compete, expanding the format from 16 teams as in the previous five Euro tournaments. For forecasting the winning probability of each team a predictive model based on bookmaker odds from 19 online bookmakers is employed. The favorite is the host France with a forecasted winning probability of 21.5%, followed by the current World Champion Germany with a winning probability of 20.1%. The defending European Champion Spain follows after some gap with 13.7% and all remaining teams are predicted to have lower chances with England (9.2%) and Belgium (7.7%) being the “best of the rest”. Furthermore, by complementing the bookmaker consensus results with simulations of the whole tournament, predicted pairwise probabilities for each possible game at the Euro 2016 are obtained along with “survival” probabilities for each team proceeding to the different stages of the tournament. For example, it can be determined that it is much more likely that top favorites France and Germany meet in the semifinal (7.8%) rather than in the final at the Stade de France (4.2%) - which would be a re-match of the friendly game that was played on 13 November 2015 during the terrorist attacks in Paris and that France won 2-0. Hence it is maybe better that the tournament draw favors a match in the semifinal at Marseille (with an almost even winning probability of 50.5% for France). The most likely final is then that either of the two teams plays against the defending champion Spain with a probability of 5.7% for France vs. Spain and 5.4% for Germany vs. Spain, respectively. All forecasts are the result of an aggregation of quoted winning odds for each team in the Euro 2016: These are first adjusted for profit margins (“overrounds”), averaged on the log-odds scale, and then transformed back to winning probabilities. Moreover, team abilities (or strengths) are approximated by an “inverse” procedure of tournament simulations, yielding estimates of probabilities for all possible pairwise matches at all stages of the tournament. This technique correctly predicted the winner of the FIFA 2010 and Euro 2012 tournaments while missing the winner but correctly predicting the final for the Euro 2008 and three out of four semifinalists at the FIFA 2014 World Cup (Leitner, Zeileis, and Hornik 2008, 2010a,b; Zeileis,

Leitner, and Hornik 2012, 2014).

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