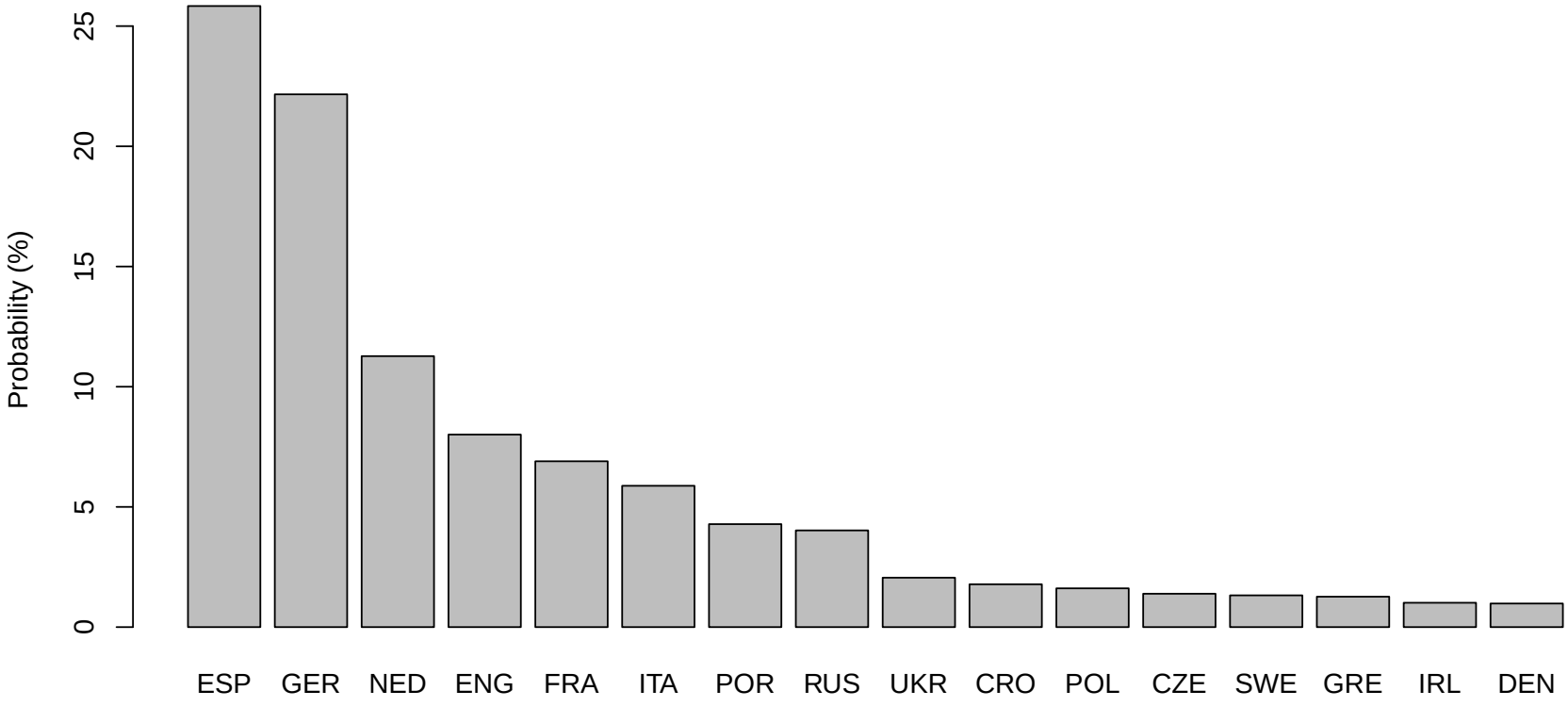
History Repeating: Spain Beats Germany in the EURO 2012 Final

Achim Zeileis, Christoph Leitner, Kurt Hornik

http://eeecon.uibk.ac.at/~zeileis/

Overview



- EURO 2012 tournament forecast based on bookmakers odds.
- Main results: Spain and Germany are the top favorites with winning probabilities of 25.8% and 22.2%, respectively.
- Most likely final: Spain vs. Germany (8.9%) with odds slightly in favor of Spain (52.9% winning probability).

Overview

- Bookmakers odds
- Modeling consensus and agreement
- Abilities and paired comparisons
- Performance throughout the tournament
- Discussion

Bookmakers odds: Motivation

Forecasts of sports events:

- Increasing interest in forecasting of competitive sports events due to growing popularity of online sports betting.
- Forecasts often based on ratings or rankings of competitors' ability/strength. In football: Elo rating, FIFA rating.
- Alternatively, bookmakers odds for winning a competition.

Advantages of bookmakers odds:

- Bookmakers can be regarded as expert judges with monetary incentives to rate competitors correctly. If they set their odds too high or low, they will lose profits.
- Prospective in nature: Bookmakers factor not only the competitors abilities into their odds but also tournament draws/seedings, home advantages, recent events such as injuries, etc.
- Winning probabilities can be derived relatively easily.

Bookmakers odds: Overround adjustment

Quoted odds: Not an honest judgment of winning chances due to inclusion of a profit margin known as “overround”.

$$\textit{quoted odds}_i \;=\; \textit{odds}_i \cdot \delta + 1,$$

- where $\textit{odds}_i$ is the bookmaker’s “true” judgment of the odds for competitor i,
- δ is the bookmaker’s payout proportion (overround: $1 - \delta$),
- and $+1$ is the stake.

Winning probabilities: The adjusted $\textit{odds}_i$ then corresponding to the odds of competitor i for losing the tournament. They can be easily transformed to the corresponding winning probability

$$p_i \;=\; 1 \;-\; \frac{\textit{odds}_i}{1 + \textit{odds}_i}.$$

Bookmakers odds: Overround adjustment

Determining the overround: Assuming that a bookmaker's overround is constant across competitors, it can be determined by requiring that the winning probabilities of all competitors (here: all 16 teams) sum to 1: $\sum_i p_i = 1$.

Illustration: EURO 2012 rating for Spain by bookmaker bwin.

- Bookmaker bwin pays 3.75 for a stake of 1 set on a victory of Spain, i.e., a profit of 2.75.
- The overround implied by bwin's quoted odds for all 16 teams in the tournament is 14.8%.
- Thus, bwin's implied odds for Spain are: $3.227 = (3.75 - 1)/(1 - 0.148)$, i.e., it is more than three times more likely that Spain loses vs. wins.
- The corresponding winning probability for Spain is 23.7%.

Bookmakers odds: EURO 2012

Data processing:

- Quoted odds from 23 online bookmakers.
- Obtained on 2012-05-09 from `http://www.oddscomparisons.com/football/european-championship/` and `http://www.bwin.com/`.
- Computed overrounds $1 - \delta_b$ individually for each bookmaker $b = 1, \ldots, 23$ by unity sum restriction across teams $i = 1, \ldots, 16$.
- Median overround is 14.3%.
- Yields overround-adjusted and transformed winning probabilities $p_{i,b}$ for each team i and bookmaker b.

Modeling consensus and agreement

Goal: Get consensus probabilities by aggregation across bookmakers.

Strategy:

- Employ statistical model assuming some latent consensus probability p_i for team i along deviations $\epsilon_{i,b}$.
- Additive model is plausible on suitable scale, e.g., logit or probit.
- Logit is more natural here, as it corresponds to log-odds.
- Methodology can also be used for consensus ratings of default probability in credit risk rating of bank b for firm i.

Model: Bookmaker consensus model

$$\text{logit}(p_{i,b}) \;=\; \text{logit}(p_i) \;+\; \epsilon_{i,b},$$

where further effects could be included, e.g., group effects in consensus logits or bookmaker-specific bias and variance in $\epsilon_{i,b}$.

Modeling consensus and agreement

Here:

- Simple fixed-effects model with zero-mean deviations.
- Consensus logits are simply team-specific means across bookmakers:

$$\widehat{\text{logit}(p_i)} \;=\; \frac{1}{23}\sum_{b=1}^{23}\text{logit}(p_{i,b}).$$

- Consensus winning probabilities are obtained by transforming back to the probability scale:

$$\hat{p}_i \;=\; \text{logit}^{-1}\left(\widehat{\text{logit}(p_i)}\right).$$

- Model captures 99.0% of the variance in $p_{i,b}$ and the associated estimated standard error is 0.1155.

Modeling consensus and agreement

Team	FIFA code	Probability	Log-odds	Log-ability	Group
Spain	ESP	25.8	−1.055	−2.025	C
Germany	GER	22.2	−1.256	−2.140	B
Netherlands	NED	11.3	−2.063	−2.464	B
England	ENG	8.0	−2.441	−2.654	D
France	FRA	6.9	−2.602	−2.700	D
Italy	ITA	5.9	−2.773	−2.776	C
Portugal	POR	4.3	−3.107	−2.857	B
Russia	RUS	4.0	−3.172	−2.993	A
Ukraine	UKR	2.1	−3.863	−3.158	D
Croatia	CRO	1.8	−4.009	−3.178	C
Poland	POL	1.6	−4.111	−3.332	A
Czech Republic	CZE	1.4	−4.263	−3.351	A
Sweden	SWE	1.3	−4.313	−3.266	D
Greece	GRE	1.3	−4.356	−3.375	A
Republic of Ireland	IRL	1.0	−4.582	−3.348	C
Denmark	DEN	1.0	−4.614	−3.325	B

Abilities and paired comparisons

Question: Is Spain really the strongest team in the tournament?

Motivation:

- Germany was apparently drawn in a stronger group than Spain.
- Tournament schedule was known to bookmakers and hence factored into their quoted odds.
- Can abilities (or strengths) of the teams be obtained, adjusting for such tournament effects?

Answer: Yes, an approximate solution can be found by simulation when

- adopting a standard model for paired comparisons (i.e., matches),
- assuming that the abilities do not change over the tournament.

Abilities and paired comparisons

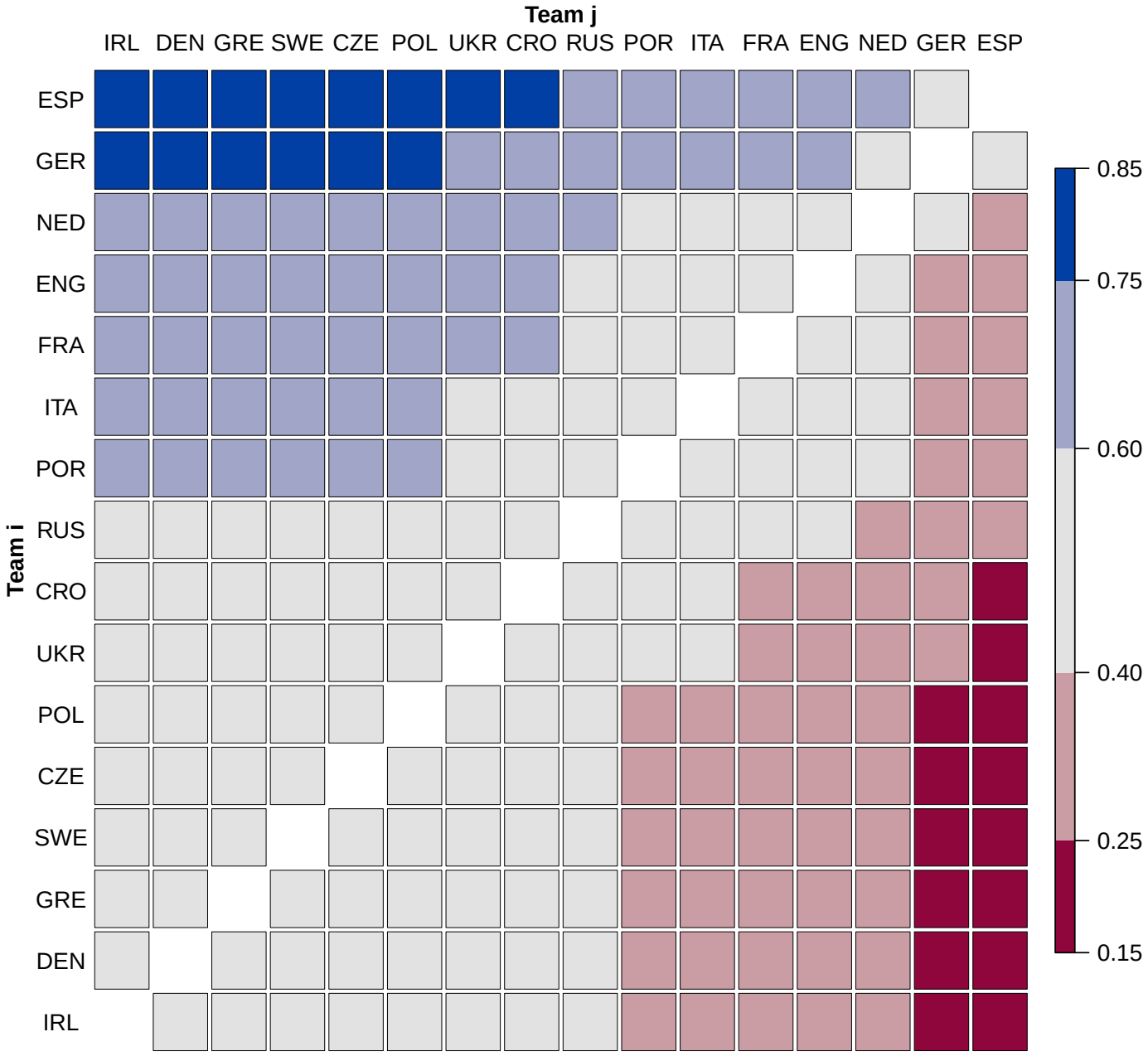
Strategy: Based on Bradley-Terry model.

- Standard model to derive pairwise winning probabilities $\pi_{i,j}$ from a set of abilities:

$$\Pr(i \text{ beats } j) \;=\; \pi_{i,j} \;=\; \frac{\mathit{ability}_i}{\mathit{ability}_i + \mathit{ability}_j}.$$

- Given $\pi_{i,j}$ the whole tournament can be simulated (assuming the abilities do not change over the course of the tournament).
- Using "many" simulations (here: 100,000) of the tournament, the empirical relative frequencies $\tilde{p}_i$ of each team i winning the tournament can be determined.
- Choose $\mathit{ability}_i$ for $i = 1, \ldots, 16$ such that the simulated winning probabilities $\tilde{p}_i$ approximately match the consensus winning probabilities $\hat{p}_i$.
- Found by simple iterative local search starting from log-odds.

Abilities and paired comparisons

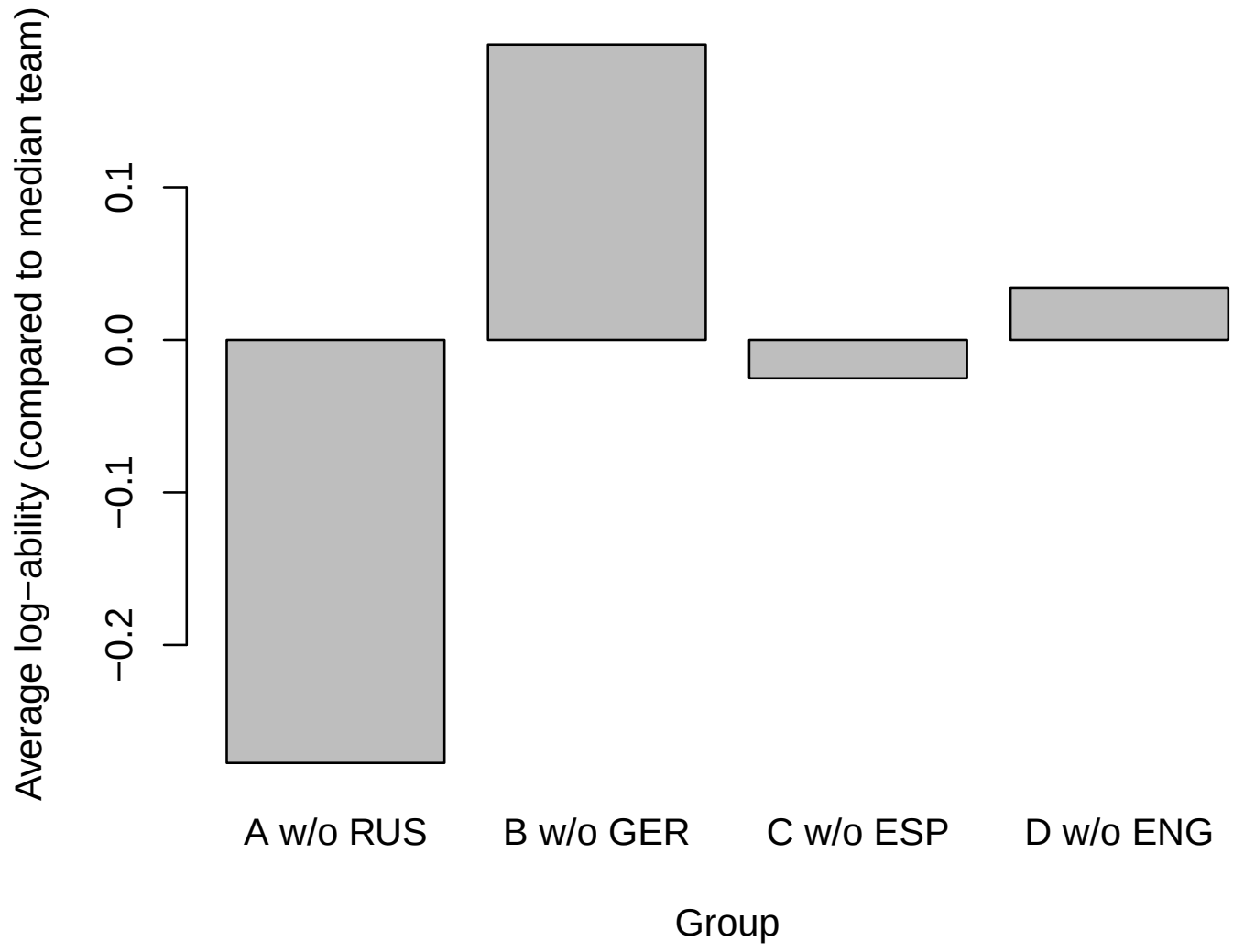


Abilities and paired comparisons

Group effects:

- Germany has to play the much stronger group (B) than Spain (C).
- However, in the quarter-finals Germany plays against an opponent from the weakest group (A), provided they proceed to that stage.
- Hence, it is not much harder for Germany to proceed to the final than for Spain.
- However, more disadvantages for The Netherlands and Portugal to be drawn in the same group as Germany.
- A final of Spain vs. Germany can be expected to be very close. There is only a slight advantage for Spain with a winning probability of 52.9%.

Abilities and paired comparisons



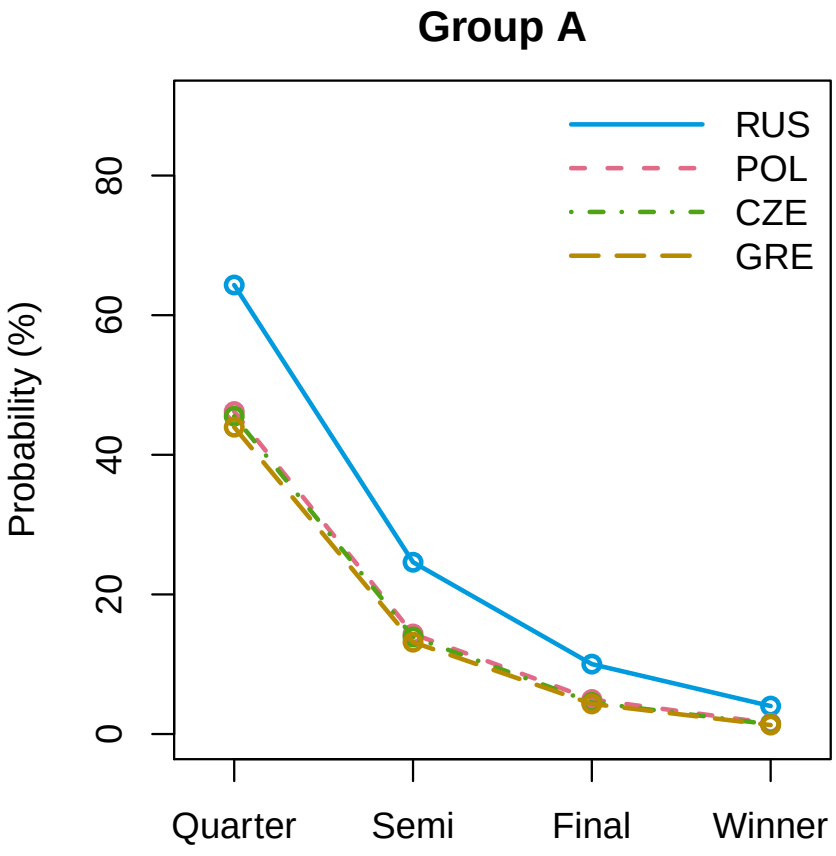
Performance throughout the tournament

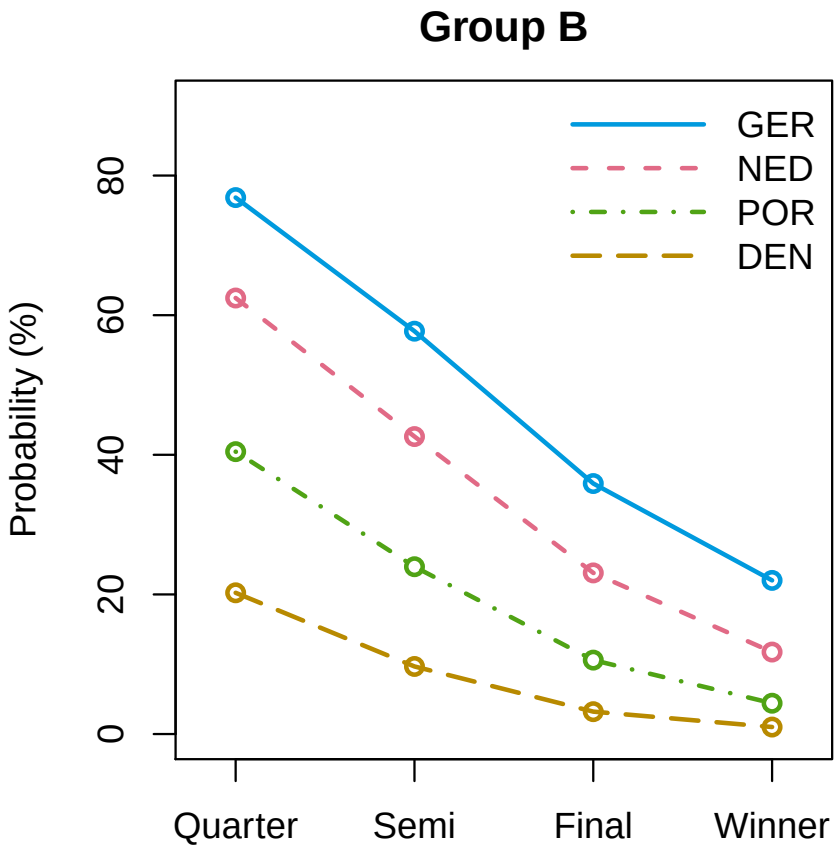
Furthermore: Simulation approach does not only provide probabilities for winning the tournament but also for “surviving” each stage of the tournament (group phase, quarter- and semi-finals).

Results:

- Groups B, C, and D have more or less clear favorites.
- Group A has no clear favorite.
- Probability to proceed to semifinals is extremely low for teams from group A because they have to face teams from group B in the quarterfinals.
- Group D is particularly exciting because the group’s favorites (England and France) are extremely close and only one can avoid facing the expected group C winner Spain in the quarterfinals.

Performance throughout the tournament





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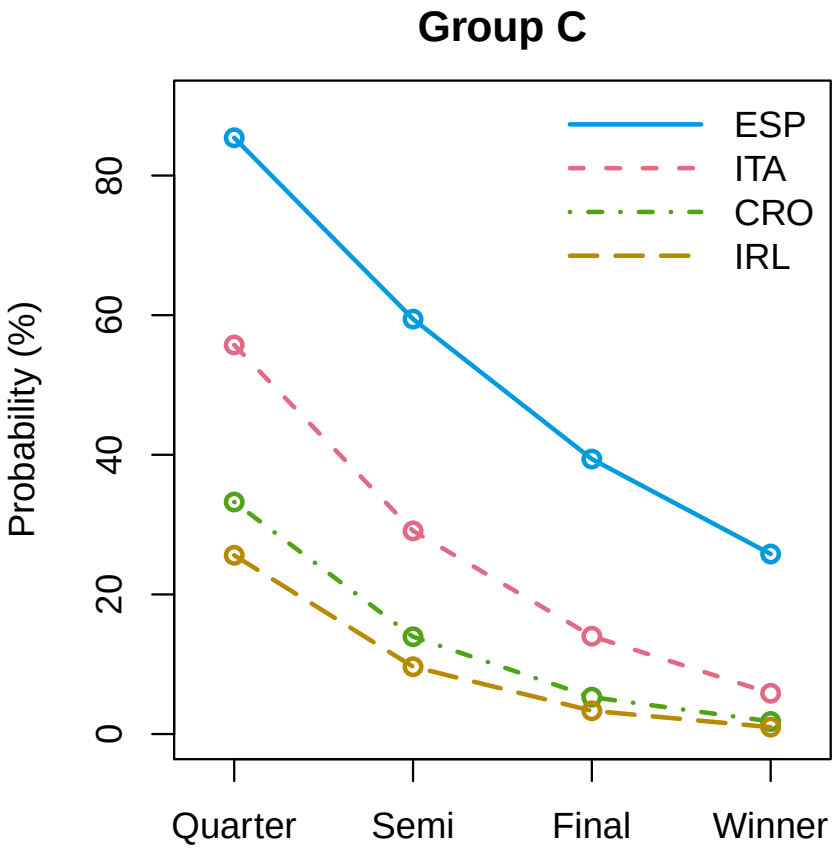

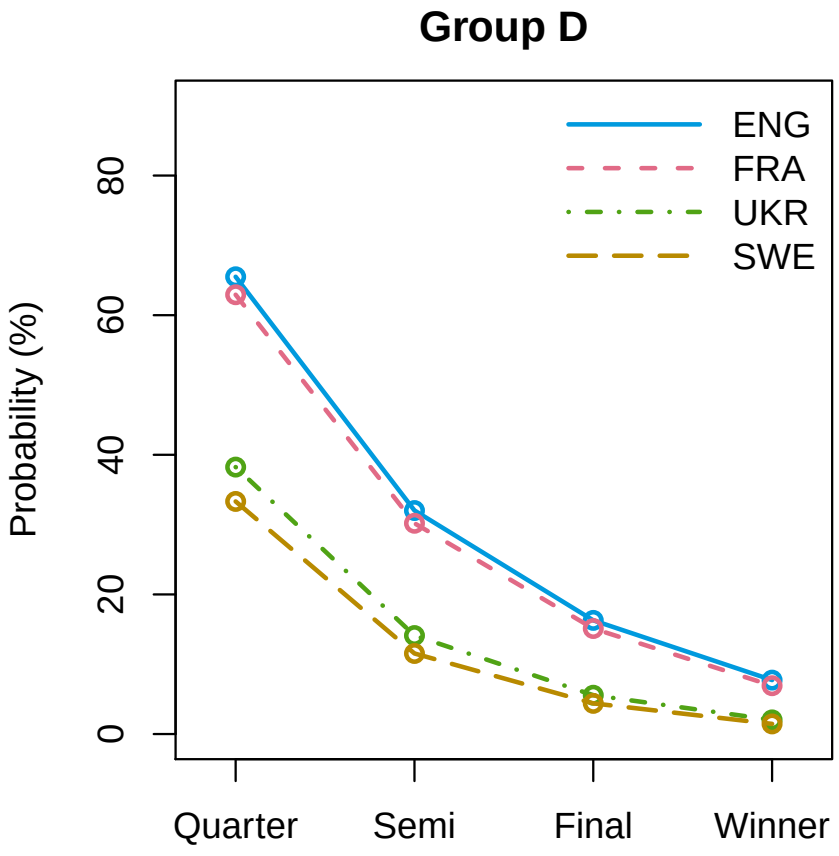

Discussion

- Winning probabilities for EURO 2012 are obtained from quoted odds of 23 online bookmakers.
- Basis is adjustment for overround and averaging on suitable log-odds scale.
- Furthermore, implied team abilities are inferred by classical pairwise-comparison model in combination with iterated tournament simulations.
- Approach outperformed Elo and FIFA ratings for EURO 2008 and correctly predicted the final (Germany vs. Spain).
- Also correctly predicted FIFA 2010 World Cup winner (Spain).
- Nevertheless, all forecasts are in terms of probabilities much lower than 100%. Other outcomes are not unlikely, hopefully making EURO 2012 the exciting event that football fans worldwide are looking forward to.

References

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