How much chance to win the Worldcup 2018 does your team have?

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An Elo ratings based Monte Carlo simulation is performed for FIFA Worldcup Russia 2018.

football | Worldcup | Monte Carlo simulation | Elo ratings

The outcome of FIFA Worldcup Russia 2018 is of great interest of everyone. The aim of this report is to provide a good reference for discussions on it.

Method

We sample the results by the Monte Carlo method. The probabilities of winning, draw, and lose for each match are estimated from the Elo ratings on the day opening game (https://www.eloratings.net). For final rounds in which one will either win or lose, we use the standard winning probability expected from the Elo ratings,

$$P_w(\delta) = \frac{1}{1 + 10^{-\frac{\delta}{400}}}, \quad [1]$$

where $\delta = \text{Elo}^{\text{you}} - \text{Elo}^{\text{opponent}}$ is the difference of Elo ratings between the team of your interest and the opponent.

While probability of draw in football matches is considerable ($25 \sim 30\%$) and that plays an important role for group league results, Elo ratings gives only the probabilities of win and lose. Therefore, we here take the following draw probability function

$$P_d(\delta) = \frac{0.3}{1 + \left(\frac{|\delta|}{300}\right)^2}, \quad [2]$$

to approximate the empirical probability of draw (http://www.collective-behavior.com/publ/ELO.pdf). The probability of win for group league matches is then assumed to be

$$P_w^{GL}(\delta) = P_w(\delta) - \frac{P_d(\delta)}{2}, \quad [3]$$

so that the average change of Elo ratings after matches obeying this probability is 0. As shown in Fig.1, these modified winning and loosing probability functions take positive values at least in the range of $|\delta| < 600$, which covers all possible pairs in the Worldcup games.

Result

Table 1 shows the estimated probabilities of the final results for all the participating countries, calculated from 1 billion samples, i.e. roughly equal to the age of the earth if each sampling really took 4 years. The chance to win the cup is dominated by Brazil, Germany, and Spain ($> 60\%$). The probability to have a first-time Worldcup winner is estimated to be less than 20%.

Table 1. Estimated probabilities of final results [%].

Ctry.	Elo R.	1.	2.	4.	8.	16.	32.
BRA	2142	31.4	13.8	15.4	16.0	19.6	3.75
DEU	2077	17.1	13.2	16.8	17.8	29.0	6.15
ESP	2044	14.0	12.2	21.7	25.1	14.9	12.1
FRA	1987	5.99	6.98	15.9	22.4	27.8	21.0
ARG	1986	6.12	7.55	15.1	24.5	34.9	11.7
PRT	1970	5.81	7.99	17.7	24.5	19.9	24.2
ENG	1948	4.20	6.25	11.0	34.5	30.9	13.2
BEL	1939	3.73	5.86	10.7	33.8	31.6	14.4
COL	1928	2.79	4.78	9.31	27.6	38.6	17.0
PER	1915	2.01	3.61	9.60	17.8	28.6	38.4
URY	1894	2.01	3.93	12.2	20.9	52.8	8.25
CHE	1890	1.32	3.05	6.57	11.7	36.8	40.6
DEN	1856	0.640	1.60	5.11	11.9	23.5	57.2
HRV	1853	0.810	2.03	6.85	15.4	36.8	38.1
MEX	1850	0.628	1.67	4.10	8.58	38.0	47.0
POL	1831	0.538	1.53	4.16	17.7	37.1	38.9
SWE	1795	0.181	0.644	1.98	5.08	27.5	64.6
IRN	1789	0.181	0.642	2.80	7.52	11.6	77.3
SRB	1777	0.106	0.439	1.54	4.15	19.1	74.7
ICL	1764	0.113	0.456	2.22	6.96	23.8	66.5
SEN	1750	0.0862	0.379	1.44	8.37	25.2	64.5
CRI	1744	0.0456	0.226	0.920	2.84	14.9	81.0
AUS	1742	0.0433	0.203	1.00	3.69	11.6	83.4
MAR	1733	0.0450	0.216	1.21	4.12	7.97	86.4
KOR	1714	0.0227	0.126	0.549	1.97	15.0	82.3
JPN	1684	0.0155	0.0984	0.502	3.86	15.9	79.6
NGA	1681	0.0131	0.0831	0.591	2.63	13.0	83.7
RUS	1678	0.0304	0.202	1.33	6.13	39.7	52.6
PAN	1659	0.0087	0.0649	0.398	3.03	10.4	86.1
TUN	1657	0.0082	0.0622	0.384	2.95	10.2	86.4
EGY	1646	0.0131	0.104	0.791	4.27	32.1	62.7
SAU	1591	0.0028	0.0303	0.301	2.14	21.1	76.4

Table 2. Estimations of group league results [%].

Country	Elo R.	1st.	2nd.	3rd.	4th.
RUS	1678	12.8	34.5	30.3	22.4
SAU	1591	4.87	18.7	30.3	46.1
EGY	1646	9.15	28.1	33.1	29.7
URY	1894	73.1	18.6	6.33	1.92
PRT	1970	33.5	42.3	17.7	6.50
ESP	2044	57.8	30.1	9.51	2.61
MAR	1733	2.92	10.6	31.8	54.6
IRN	1789	5.79	16.9	41.0	36.3
FRA	1987	50.8	28.2	15.1	5.83
AUS	1742	4.66	11.9	25.6	57.9
PER	1915	28.3	33.4	25.3	13.1
DEN	1856	16.3	26.5	34.0	23.2
ARG	1986	64.1	24.2	9.05	2.69
ICL	1764	9.48	24.1	37.2	29.2
HRV	1853	22.8	39.1	25.4	12.8
NGA	1681	3.61	12.7	28.4	55.3
BRA	2142	81.5	14.8	3.15	0.606
CHE	1890	12.6	46.9	26.5	14.0
CRI	1744	2.35	16.6	33.1	47.9
SRB	1777	3.59	21.8	37.2	37.5
DEU	2077	76.6	17.3	4.97	1.17
MEX	1850	13.2	39.8	29.6	17.4
SWE	1795	7.41	28.0	36.2	28.4
KOR	1714	2.79	14.9	29.2	53.1
BEL	1939	45.5	40.1	11.2	3.14
PAN	1659	3.00	10.9	39.4	46.7
TUN	1657	2.93	10.7	39.0	47.4
ENG	1948	48.5	38.3	10.4	2.80
POL	1831	26.0	35.2	24.8	14.1
SEN	1750	11.8	23.7	34.3	30.2
COL	1928	56.6	26.5	12.2	4.72
JPN	1684	5.66	14.7	28.7	51.0

Table 2 shows the probabilities of the final results of group league round. It is found that even low-ranked countries (like Japan) typically have 20% of chance to advance to finals. Wow!

Materials and Methods

In the group league, the ranks among the teams with equal points are assigned randomly. This approximation is thought to help weak teams because the ranks in such conditions in real competition is given according to the total goal difference, total goals, and so on.

We use Mersenne Twister for random number generator (M. Matsumoto and T. Nishimura, ACM Transactions on Modeling and Computer Simulation 8. (1998) 3–30).

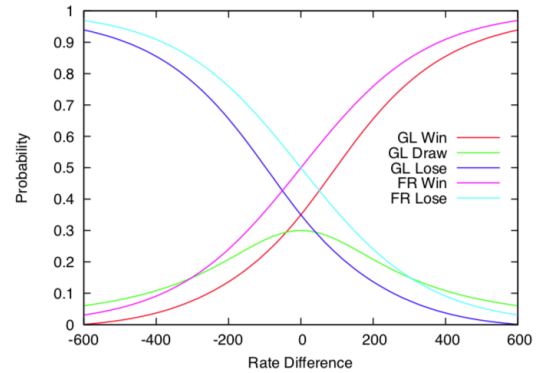We assume no home-advantage for Russia, that might be unrealistic.

Fig. 1. Probability functions of win, draw, and lose for group league matches.

TS did everything!

Nothing to declare.

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