

World Cup Qatar 2022 groupstage predictions: 2nd match day

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The statistical model (in brief)

We use a **diagonal-inflated Bivariate-Poisson model with dynamic team-specific abilities** for the attack and the defence. Let (X_i, Y_i) denote the random number of goals scored by the home and the away team in the i -th game, $i = 1, \dots, n$, respectively. `ranking` denotes the Coca-Cola FIFA ranking at October 6th, 2022, whereas `att` and `def` denote the attack and the defence abilities, respectively.

$$(X_i, Y_i) \sim \begin{cases} (1-p)\text{BP}(x_i, y_i | \lambda_1, \lambda_2, \lambda_3) & \text{if } x \neq y \\ (1-p)\text{BP}(x_i, y_i | \lambda_1, \lambda_2, \lambda_3) + pD(x, \eta) & \text{if } x = y, \end{cases} \quad (1)$$

$$\log(\lambda_{1i}) = \text{att}_{h_i, t} + \text{def}_{a_i, t} + \frac{\gamma}{2}(\text{ranking}_{h_i} - \text{ranking}_{a_i}) \quad (2)$$

$$\log(\lambda_{2i}) = \text{att}_{a_i, t} + \text{def}_{h_i, t} - \frac{\gamma}{2}(\text{ranking}_{h_i} - \text{ranking}_{a_i}), \quad i = 1, \dots, n \text{ (matches)}, \quad (3)$$

$$\log(\lambda_{3i}) = \rho, \quad (4)$$

$$\text{att}_{k, t} \sim \mathcal{N}(\text{att}_{k, t-1}, \sigma^2), \quad (5)$$

$$\text{def}_{k, t} \sim \mathcal{N}(\text{def}_{k, t-1}, \sigma^2), \quad (6)$$

$$\rho, \gamma \sim \mathcal{N}(0, 1) \quad (7)$$

$$p \sim \text{Uniform}(0, 1) \quad (8)$$

$$\sum_{k=1}^{n_t} \text{att}_k = 0, \quad \sum_{k=1}^{n_t} \text{def}_k = 0, \quad k = 1, \dots, n_t \text{ (teams)}, \quad t = 1, \dots, T \text{ (times)}. \quad (9)$$

Lines (1) displays the likelihood's equations (diagonal inflated bivariate Poisson); lines (2)-(4) display the log-linear models for the scoring rates λ_1, λ_2 and the covariance parameter λ_3 ; lines (5)-(6) display the dynamic prior distributions for the attack and the defence parameters, respectively; lines (7)-(8) display prior distributions for the other model parameters; line (9) displays the sum-to-zero identifiability constraints. Model fitting has been obtained through the Hamiltonian Monte Carlo sampling, 2000 iterations, 4 chains using the `footBayes` R package (with the underlying `rstan` package). The historical data used to fit the models come from *all the international matches played during the years' range 2018-2022*.

The idea is to provide a dynamic predictive scenario: at the end of each match-day, the model will be refitted to predict the remaining matches.

Groupstage predictions: 1st day (25-28 November)

Posterior matches probabilities from the posterior predictive distribution of the model above are displayed in the table below. **mlo** denotes the most likely exact outcome (in parenthesis, the corresponding posterior probability). Darker regions in the plots below denote more likely outcomes: on the x -axis the home goals, on the y -axis the away goals.

home	away	home win	draw	away win	mlo
Wales	Iran	0.327	0.305	0.369	0-0 (0.149)
Qatar	Senegal	0.239	0.292	0.469	0-1 (0.162)
Netherlands	Ecuador	0.602	0.246	0.152	1-0 (0.154)
England	United States	0.493	0.272	0.235	1-0 (0.146)
Tunisia	Australia	0.368	0.318	0.313	0-0 (0.163)
Poland	Saudi Arabia	0.396	0.310	0.294	0-0 (0.161)
France	Denmark	0.419	0.288	0.293	0-0 (0.13)
Argentina	Mexico	0.605	0.265	0.130	1-0 (0.185)
Japan	Costa Rica	0.646	0.235	0.120	1-0 (0.171)
Germany	Spain	0.207	0.239	0.554	0-1 (0.119)
Belgium	Morocco	0.590	0.258	0.153	1-0 (0.169)
Croatia	Canada	0.429	0.294	0.277	1-0 (0.145)
Cameroon	Serbia	0.215	0.285	0.500	0-1 (0.161)
Brazil	Switzerland	0.703	0.212	0.086	1-0 (0.17)
Portugal	Uruguay	0.425	0.284	0.292	1-0 (0.128)
South Korea	Ghana	0.594	0.257	0.149	1-0 (0.173)

