Brier Score [Proper, Feasible] The above skill scores may all be used to score forecasts with continuous PDFs. The following score is used for binary events in a categorical setting. Let p denote the forecast probability of an event occurring. Then there is a forecast probability of $1 - p$ that it does not occur. Following the notation in Benedetti [1] the event occurring is represented by the vector $(1, 0)$ and its non-occurrence by $(0, 1)$. Then given that event

$$\hat{e}_k \in \{(1, 0), (0, 1)\}$$

occurs (one of these two vectors) the Brier score is calculated as:

$$S(p, \hat{e}_k) = |(p, 1 - p) - \hat{e}_k|^2 \tag{1}$$

Where $|.|$ denotes Euclidean distance between two vectors. Ferro [2] shows that the Brier score is not Fair. The concept of Locality does not apply to Binary scores since once p is specified, the remaining probability is immediately specified.

Bibliography

[1] R. Benedetti. Scoring rules for forecast verification. Mon. Wea. Rev, 138:203 – 211, 2010.

[2] C. Ferro. Fair scores for ensemble forecasts. Quarterly journal of the Royal Meteorological Society, 140:1917–1923, 2014.