

## Consensus Priors in the Presence of General Laws

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### Abstract

In the context of Bayesian estimation of models for binary data, with parameter  $\theta$  representing the true proportion of successes, Jeffreys studied the possibility of putting a prior point probability mass on the extremes to allow for general laws  $\theta = 0$  or  $\theta = 1$ . Bernardo's apparent improvement, based on the choice between homogeneity and heterogeneity, reflects a bias towards the proposed general law after the first observation, which seems unjustified: a success or failure *has* to occur. A straightforward adjustment considering the situation after the first observation, for both the hypergeometric and binomial models, is proposed for a consensus prior, i.e. a generally agreed on noninformative prior. This recommendation generalises under the multinomial model, for which a new rule, catering for many potential general laws, is proposed. Finally, the inconsistency between the uniform prior for the hypergeometric parameter and the U-shaped reference/Jeffreys prior for the binomial parameter is also discussed.

**Keywords:** Hypergeometric, binomial, multinomial, Bayes-Laplace prior, Jeffreys prior, reference prior, point probability mass.

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