

Optimal properties of some Bayesian inferences

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Abstract

Relative surprise regions are shown to minimize, among Bayesian credible regions, the prior probability of covering a false value from the prior. Such regions are also shown to be unbiased in the sense that the prior probability of covering a false value is bounded above by the prior probability of covering the true value. Relative surprise regions are shown to maximize both the Bayes factor in favor of the region containing the true value and the relative belief ratio, among all credible regions with the same posterior content. Relative surprise regions emerge naturally when we consider equivalence classes of credible regions generated via reparameterizations.

Keywords: relative surprise inferences, probability of covering a false value, unbiasedness, Bayes factors, relative belief ratios, invariance, reparameterizations.



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References

Berger, J.O., Selke, T., (1987). Testing a point null hypothesis: the irreconcilability of P-values and evidence. *Journal of American Statistical Association* 33, 112–122. [MR0883340](#)

Carlin, B.P. and Louis, T.A., (2000). *Bayes and Empirical Bayes Methods for Data Analysis*. Second Edition. Chapman and Hall/CRC, Boca Raton. [MR1427749](#)

Casella, G., and Berger, R.L. (1987). Reconciling Bayesian and Frequentist evidence in the one-sided testing problem. *Journal of the American Statistical Association* 82, 106–111. [MR0883339](#)

DeGroot, M. (1970). *Optimal Statistical Decisions*. McGraw-Hill, New York. [MR0356303](#)

Evans, M. (1997). Bayesian inference procedures derived via the concept of relative surprise. *Communications in Statistics - Theory And Methods*, Vol. 26, No. 5, 1125–1143. [MR1450226](#)

Evans, M., Guttman, I. and Swartz, T. (2006). Optimality and computations for relative surprise inferences. *Canadian Journal of Statistics*, Vol. 34, No. 1, 113–129. [MR2267713](#)

Evans, M. and Moshonov, H. (2006). Checking for prior-data conflict. *Bayesian Analysis*, Volume 1, Number 4, 893–914. [MR2282210](#)

Evans, M. and Moshonov, H., (2007). Checking for prior-data conflict with hierarchically specified priors. *Bayesian Statistics and its Applications*, eds. A.K. Upadhyay, U. Singh, D. Dey, Anamaya Publishers, New Delhi, 145–159. [MR2282210](#)

Evans, M., and Zou, T. (2002). Robustness of relative surprise inferences to choice of prior. Recent Advances in Statistical Methods, Proceedings of Statistics 2001 Canada, Yogendra P. Chaubey (ed.), 90–115, Imperial College Press. [MR2023214](#)

Gelman, A. Carlin, J.B., Stern, H.S., and Rubin, D.B. (2004). Bayesian Data Analysis. Second Edition. Chapman and Hall/CRC, Boca Raton. [MR2027492](#)

Good, I.J. (1988), Surprise index, in Encyclopaedia of Statistical Sciences, Vol. 7, eds. S. Kotz, N.L. Johnson and C.B. Reid, New York: John Wiley and Sons. [MR0976457](#)

Joshi, V.M. (1974). A note on the incompatibility of one-sided Bayes and frequency confidence intervals. Journal of the Royal Statistical Society, Series B, Vol. 36, No. 2, 237–242. [MR0362673](#)

Plante, A. (1991). An inclusion-exclusion approach to the problem of absurd confidence statements; 1. Consistent exact confidence-interval estimation. Canadian Journal of Statistics, Vol. 19, No. 4, 389–397. [MR1166845](#)

Robert, C. (2001). The Bayesian Choice. Second Edition. Springer-Verlag, New York. [MR1835885](#)

Rudin, W. (1974). Real And Complex Analysis, Second Edition. McGraw-Hill, New York. [MR0344043](#)

Samaniego, F.J. and Reneau, D.M. (1994). Toward a Reconciliation of the Bayesian and Frequentist Approaches to Point Estimation. Journal of the American Statistical Association, Vol. 89, No. 427 (Sep., 1994), 947–957. [MR1294739](#)

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