DECISION MAKING BASED ON BAYESIAN INFERENCE

**Learning objectives**

* Loss functions and relation to Bayesian decision making.
* Optimal decisions given a posterior distribution and a loss function.
* Decide between hypotheses given a loss function.
* Compare multiple hypotheses using Bayes Factors.
* Conceptualize Lindley’s paradox and how the Bayes Factor depends on prior elicitation.
* Make inferences about a proportion using a conjugate Beta prior.
* Identify assumptions relating to a statistical inference.
* Create point estimates and credible intervals by averaging over multiple hypotheses.

BF(H2:H1) = the evidence against H2

BF(H1:H2) = the evidence against H1

If we have BF(H1:H2)=0.0108 => BF(H2:H1) = 1/ 0.0108 = 92.59259

|  |  |
| --- | --- |
| BF (H2:H1) | Evidence against H1 |
| 1 to 3 | Not worth a bare mention |
| 3 to 20 | Positive |
| 20 to 150 | Strong |
| >150 | Very strong |

If H1: patient does not have HIV and H2: patient has HIV => from the above result, we can say: even the posterior for having HIV given a positive result was low BF(H2:H1) given the positive test, we would still conclude the patient has HIV

Another interpretation by [Kass and Raftery](https://statswithr.github.io/book/stochastic-explorations-using-mcmc.html#ref-kass1995bayes) ([1995](https://statswithr.github.io/book/stochastic-explorations-using-mcmc.html#ref-kass1995bayes))

|  |  |
| --- | --- |
| 2\*log(BF (H2:H1)) | Evidence against H1 |
| 0 to 2 | Not worth a bare mention |
| 2 to 6 | Positive |
| 6 to 10 | Strong |
| >10 | Very strong |

Chapter 4. Inference and Decision-making with multiple parameters