Why is Gamma(0,0) equivalent to the Jeffreys prior

I'm trying to use some code that includes Gamma priors for Poisson (rate) and Exponential (rate) distributions. I want to make the priors noninformative. I read that using a Gamma(0,0) is equivalent to the Jeffreys prior, which is noninformative. Is this true? Can anyone suggest any references for this? I thought the shape and scale parameters of a Gamma distribution had to be positive. Thanks.

bayesian gamma-distribution jeffreys-prior

asked Aug 8 '14 at 17:49

MaggieS
21 1

2 What exactly is a "Gamma(0,0)"? Perhaps you should cite your reference--and preferably provide a link to it. – whuber ♦ Aug 8 '14 at 18:03

1 Answer

No, a Gamma(0,0) is not equivalent to the Jeffreys prior of the Poisson and Exponential rates (it is not even well defined). By Gammao(0,0) people usually mean a $Gamma(\epsilon, \epsilon)$ with $\epsilon \approx 0$. Its use became popular since the people from WINBUGS claimed that it "resembles" the shape of the Jeffreys prior for the variance parameters in certain hierarchical models. However, it has many detractors.

See also: Exponential Distribution - Rate - Bayesian Prior?

Although the Gamma prior is decreasing, the tails of this and the Jeffreys priors are different. Moreover, the Jeffreys prior of the Exponential is $1/\lambda$, while in the Poisson case is $\lambda^{-1/2}$, then, the claimed resemblance is not theoretically justified. In practice, however, with large or moderate samples, the influence of the prior is usually negligible. For these simple models, you can simply use the exact expression of the Jeffreys priors since they produce proper posteriors and they are easy to sample from using basic MCMC algorithms.

edited Aug 8 '14 at 18:15

answered Aug 8 '14 at 18:10

Lachos
56 3

2 +1. The reason "Gamma(0,0)" makes no sense is that the *double limit* of the PDFs $f(x; a, b)$ given by $\lim_{a\to 0^+, b\to 0^+} f(x; a, b)$ is undefined. One can obtain different functions by making b vary differently in terms of a as a is made smaller. – whuber ♦ Aug 8 '14 at 18:26