**Types of Prior Distribution**

**Informative Priors**

An informative prior expresses specific, definite information about a variable. An example is a prior distribution for the temperature at noon tomorrow. A reasonable approach is to make the prior a normal distribution with expected value equal to today's noontime temperature, with variance equal to the day-to-day variance of atmospheric temperature.

This example has a property in common with many priors, namely, that the posterior from one problem (today's temperature) becomes the prior for another problem (tomorrow's temperature); pre-existing evidence which has already been taken into account is part of the prior and as more evidence accumulates the prior is determined largely by the evidence rather than any original assumption, provided that the original assumption admitts the possibility of what the evidence is suggesting. The terms "prior" and "posterior" are generally relative to a specific datum or observation .

**Non-informative Prior**

A non-informative prior expresses vague or general information about a variable. The term non-informative prior is a misnomer; such a prior might be called a not very informative prior. Non-informative priors can express information such as the variable is positive or the variable is less than some limit.

One way of constructing a prior distribution for a parameter *θ* (is to use a non-informative or flat prior distribution) i.e.

*p(θ) = constant (for all θ).*

Non-informative priors can usually be obtained as special, or limiting, cases of conjugate priors. Non-informative priors are the usual way of representing ignorance about parameters and they are frequently used in practice. The use of a non-informative prior typically yields results which are not too different from conventional statistical analysis, as the likelihood function often yields more information than the non-informative prior does.

**Uniform Prior**

The simplest situation to consider is when  is a finite, consisting of say *n* observations. The obvious prior is to then give each  probability , one might generalize this to infinite  equal density, arriving at the Uniform non-informative prior  (Berger,1985).

A Uniform distribution over a finite range is informative in the sense that values of the parameter are excluded (if the prior is zero over some range, the posterior distribution will be zero over that range). Such a prior is non-informative only if the parameter has a range that coincides with that of Uniform distribution. Laplace introduced the principle of insufficient reason for which he implied that in the absence of any information about a parameter, all values should be equally likely, but criticized due to lack of invariance under transformation. Due to lack of invariance under transformation, the Uniform prior is considered undesirable. But it should be noted, however that Uniform prior have to be applied to many problems, and often the results are entirely satisfactory.

**Jeffreys Prior**

In Bayesian probability, the Jeffreys prior (called after Harold Jeffreys) is a non-informative prior distribution proportional to the square root of the determinant of the Fisher information matrix. Symbolically, the Jeffreys prior distribution  is given by:

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Where  is a vector of parameters, ‘det’ denotes the determinant and  is the  Fisher information matrix which is the logarithm of likelihood function  of parameters  and partially differentiating twice with respect to the parameters as given below,



Where E denotes the expectation on data and *i* and *j* stands for rows and columns of determinant respectively.

Jeffreys prior has an invariance property with respect to a one-to-one transformation of the parameters in the sense that we get consistent answer in any parameterisation. Bernado (1979) shows that the Jeffreys prior is appropriate reference prior if, there are no nuisance parameters and if, the joint posterior distribution of all the parameters is asymptotically normal. Aslam (2002) discusses another important aspect of this prior that it is not affected by a restriction on the parameter space.