10. **Inference about the Box-Cox transformation**

Suppose one observes the positive values $y_1, ..., y_n$ that exhibit some right-skewness. Box and Cox (1964) suggested using the power transformation

$$w_i = \frac{y_i^\lambda - 1}{\lambda}, i, = 1, ..., n,$$

such that $w_1, ..., w_n$ represent a random sample from a normal distribution with mean μ and standard deviation σ. Suppose that the vector of parameters (λ, μ, σ) is assigned the noninformative prior proportional to $1/\sigma$. Then the posterior density of θ is given, up to a proportionality constant, by

$$g(\theta|y) \propto \frac{1}{\sigma} \prod_{i=1}^{n} \left[\phi \left(\frac{y_i^\lambda - 1}{\lambda}; \mu, \sigma \right) y_i^{\lambda-1} \right].$$

翻译：

关于博克斯-考克斯变换的推断

假设我们观察了正值$y_1,\cdots,y_n$，它们表现出一些右倾性。博克斯和考克斯（1964）建议使用幂变换

$$w_i = \frac{y_i^\lambda - 1}{\lambda}, i = 1,\ldots,n,$$

其中$w_1,\ldots,w_n$代表一个服从均值为μ，方差为σ的正态分布随机样本。假设参数向量(λ, μ, σ)服从无信息先验分布正比于$1/\sigma$。已知θ的后验密度

$$g(\theta|y) \propto \frac{1}{\sigma}\prod_{i=1}^{n}\left[\phi\left(\frac{y_i^{\lambda}-1}{\lambda};\mu,\sigma\right)y_i^{\lambda-1}\right].$$

假设这个转化模型适用于对多发性骨髓瘤的研究，患者的存活时间如下：

13	52	6	40	10	7	66	10	10	14	16	4
65	5	11	10	15	5	76	56	88	24	51	4
40	8	18	5	16	50	40	1	36	5	10	91
18	1	18	6	1	23	15	18	12	12	17	3

(a) 写一个 R 函数来计算(λ,μ,σ)的后验分布的对数。

(b) 使用 laplace 此命令