Homework Set #8 Solutions

$(n_1, n_2) \sim MULT(n, \pi_1, \pi_2)$, $H_0: \pi_1 = .75, \pi_2 = .25$

data: $n_1 = 854$, $n_2 = 249$, $n = 1103$

$m_1 = 827.25$, $m_2 = 275.75$ $\quad (m_j = n\pi_{j0})$

(a) $G^2 = 2 \sum_j n_j \log\left(\frac{n_j}{\hat{m}_j}\right) = 3.539$

(b) p-value $= P(\chi^2_1 > 3.539) = .06$ $\quad (df = c-1, \ c=2)$

(c) The data provides moderate evidence against the proposed genetic model.

(d) The p-value overstates the evidence against the null model by comparing the null model to the alternative model that is best supported by the data

(e)

prior	BF_{01}
medium	1.9
wide	2.7
ultrawide	3.8

According to the Bayes Factors, the data provides evidence in favor of the null model. (i.e., in favor of the proposed genetic model)

```
> obs = c(854,249)
> n = sum(obs)

> pi.0 = c(.75,.25)
> m = n*pi.0

> G2 = 2*sum(obs*log(obs/m))
> G2
[1] 3.539017

> c = length(obs)
> pvalue.G2 = pchisq(G2,c-1,lower.tail=FALSE)
> pvalue.G2
[1] 0.05994099
```

```
> library(BayesFactor)

> y = 854
> n = 1103

> bf.medium = proportionBF(y,n,p=3/4,rscale = "medium")
> bf.wide = proportionBF(y,n,p=3/4,rscale = "wide")
> bf.ultra = proportionBF(y,n,p=3/4,rscale = "ultrawide")

> 1/bf.medium
Bayes factor analysis
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[1] Null, p=0.75 : 1.931436 ±0%

Against denominator:
  Alternative, p0 = 0.75, r = 0.5, p =/= p0
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Bayes factor type: BFproportion, logistic

> 1/bf.wide
Bayes factor analysis
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[1] Null, p=0.75 : 2.700316 ±0%

Against denominator:
  Alternative, p0 = 0.75, r = 0.707106781186548, p =/= p0
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Bayes factor type: BFproportion, logistic

> 1/bf.ultra
Bayes factor analysis
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[1] Null, p=0.75 : 3.796726 ±0.01%

Against denominator:
  Alternative, p0 = 0.75, r = 1, p =/= p0
---
Bayes factor type: BFproportion, logistic
```