Background

20/05/2020

LaplacePo<-function(y,E0,V0,tol=1E-5,n=20)  
{#MF 04/10/18  
 z0<-E0  
 d<-1  
 for (i in 1:n)  
 {if (abs(d)>tol)  
 {ez<-exp(z0)  
 f<-y-(z0-E0)/V0-ez  
 fd<--(1/V0)-ez  
 d<-f/fd  
 z0<-z0-d  
 }  
 }  
 mean<-z0  
 var<- -1/fd  
 return(list(E1=mean,V1=var))  
}  
  
LaplacePo(y=33,E0=3.384,V0=0.034,tol=1E-5,n=20)

$E1  
[1] 3.442737  
  
$V1  
[1] 0.01647875

E0\_eta<-c(3.384,3.384)  
V0\_eta<-matrix(c(0.0340,0.0085,0.0085,0.034),ncol=2)  
V0\_eta

[,1] [,2]  
[1,] 0.0340 0.0085  
[2,] 0.0085 0.0340

E1\_eta<-c(3.646,3.443) ### non-conjugate Laplace method.  
V1\_eta<-c(0.0148,0.0165) ### non-conjugate Laplace method.  
cov01<-V0\_eta[,1]  
cov10<-t(cov01)  
E1\_eta.given.x1<-E0\_eta+(1/V0\_eta[1,1])\*(E1\_eta[1]-E0\_eta[1])\*cov01  
E1\_eta.given.x1

[1] 3.6460 3.4495

cov02<-V0\_eta[,2]  
cov20<-t(cov02)  
E1\_eta.given.x2<-E0\_eta+(1/V0\_eta[2,2])\*(E1\_eta[2]-E0\_eta[2])\*cov02  
E1\_eta.given.x2

[1] 3.39875 3.44300

V1\_eta.given.x1<-V0\_eta-(1/V0\_eta[1,1])\*cov01%\*%cov10+(V1\_eta[1]/V0\_eta[1,1]^2)\*cov01%\*%cov10  
V1\_eta.given.x1

[,1] [,2]  
[1,] 0.0148 0.0037  
[2,] 0.0037 0.0328

V1\_eta.given.x2<-V0\_eta-(1/V0\_eta[2,2])\*cov02%\*%cov20+(V1\_eta[2]/V0\_eta[2,2]^2)\*cov02%\*%cov20  
V1\_eta.given.x2

[,1] [,2]  
[1,] 0.03290625 0.004125  
[2,] 0.00412500 0.016500

aa<-solve(V1\_eta.given.x1)  
bb<-solve(V1\_eta.given.x2)  
ss<-solve(V0\_eta)  
dd<-aa+bb-ss  
dd

[,1] [,2]  
[1,] 69.528352 -7.843137  
[2,] -7.843137 62.566845

V2\_eta.given.x<-solve(dd)  
V2\_eta.given.x

[,1] [,2]  
[1,] 0.014588921 0.001828811  
[2,] 0.001828811 0.016212159

betwbrac<-aa%\*%E1\_eta.given.x1+bb%\*%E1\_eta.given.x2-ss%\*%E0\_eta  
E2\_eta.given.x<-V2\_eta.given.x%\*%betwbrac  
E2\_eta.given.x

[,1]  
[1,] 3.648803  
[2,] 3.474346

Age<-c(1,2)  
plot(Age,E2\_eta.given.x,ylab=expression(eta),type="o",pch=19,col=4,ylim=c(3,4)) #### Bayes linear kinematics  
lines(Age,E1\_eta,col=2,ylab=expression(eta),pch=19,type="o") #### full- Bayes analysis

