Supplementary Material Manual

January 7, 2017

This is the guide to function **tsprt()** and **utsprt()** written in R to derive stopping boundaries of the truncated SPRTs described in the paper under the multivariate normal distribution with homogeneous variance-covariance matrices.

`tsprt`	*Stopping boundaries under a multivariate normal case*

Description

This function is used to derive stopping boundaries for the posterior probabilities for class membership 1 (against 0). The expected cost, the expected sample number (stopping time), and error rates are available as measures of test performance.

Usage

```
tsprt(m0, m1, cov, c10, c01, cn0, cn1, pi1=0.5, method=c(1,2,3,4), detail=FALSE, int)
```

Arguments

m0 $K \times 1$ vector of mean profiles for class 0

m1 $K \times 1$ vector of mean profiles for class 1

cov $K \times K$ matrix of common variance-covariance

c10 $K \times 1$ vector of error costs given class 0

c01 $K \times 1$ vector of error costs given class 1

cn0 $(K-1) \times 1$ vector of continuation costs given class 0

cn1 $(K-1) \times 1$ vector of continuation costs given class 1

pi1 The prior probability of class 1. Default is `pi1`=0.5. Note that `pi0=1-pi1`.

method Test methods: 1 (`recursive`), 2 (`simultaneous`), 3 (`tsprt3`), 4 (`single`).Method 1 and 2 are for truncated SPRT. Default is `method=1`.

detail Options for performance outputs. If `detail=FALSE`, return the total performance outputs. `detail=TRUE`, return the performance outputs contributed at each stage. Default is `FALSE`.

int Initial values for stopping boundaries to be searched. If `NULL`, default initial values are used.

Details

A required R package is `mnormt` which computes the multivariate normal probability density.

The difference between two means at every stage should not equal to zero.

`cs`(σ^2, ρ, K) can create $K \times K$ compound symmetry variance covariance structure with equal variance σ^2 and covariance ρ, and Use `ar1`(σ^2, ρ, K) for AR(1) structure with variance σ^2 and covariance $\rho^{|d|}$ at lag d.

`c10` and `c01` should be greater than `cn0` and `cn1` at every stage, respectively.

For `method=c(1,2)`, can specify $2(K-1)+1$ initial values, e.g., `int=c(rep(0,2,K-1),rep(0,8,K-1),0.5)`.

For `method=3`, can specify initial values for two parameters L_0 and L_1, e.g., `int=c(0,2,0,8)`. The boundary for the final stage is $C_{10}^K/(C_{10}^K + C_{01}^K)$.

Examples

```
## Maximum stage K=5 with flat mean profiles with compound symmetry covariance
K<-5
c10<-rep(10,K)
c01<-rep(10,K)
cn0<-rep(1,K-1)
cn1<-rep(1,K-1)
m0<-rep(0,K)
m1<-rep(2,K)
cov<-cs(1,0.1,K)
pi1<-0.5
tsprt1<-tsprt(m0,m1,cov,c10,c01,cn0,cn1,pi1,method=1,detail=FALSE);tsprt1
```

```
## $L0
## [1] 0.2082527 0.2328229 0.2620768 0.3078366 0.5000000
##
## $L1
## [1] 0.7917473 0.7671771 0.7379232 0.6921634 0.5000000
##
## $EC
## [1] 1.229921
##
## $EN
## [1] 1.456404
##
## $error10
## [1] 0.07735166
##
## $error01
## [1] 0.07735166
```

`utsprt` *Stopping boundaries under a heterogeneous multivariate case*

Description

This function is used if the assumption of homogeneity in vaiance-covariance matrices is not valid.

Usage

```
utsprt(m0, m1, cov0, cov1, c10, c01, cn0, cn1, pi1=0.5, method=c(1,2,3,4), detail=FALSE, int, nsim)
```

Arguments

cov0 $K \times K$ matrix of variance-covariance for class 0

cov1 $K \times K$ matrix of variance-covariance for class 1

method The test methods to be used: 1 (`tsprt`), 2 (`tsprt3`), 3 (`single`). Default is 1 (`simultaneous`).

nsim The number of samples to be generated for numerical computation of the expected cost. Default is `5000`.

Details

Note that means of two classes should differ at every stage.

`c10` and `c01` should be greater than `cn0` and `cn1` at every stage.

Stopping boundary at the final stage is given by $L_K = C_{10}^K/(C_{10}^K + C_{01}^K)$.

For `method=c(0,1)`, specify $2(K-1)$ initial values, e.g., `int=c(rep(0,2,K-1),rep(0,8,K-1))`.

For `method=3`, specify two initial values for parameter L_0 and L_1, e.g., `int=c(0,2,0,8)`.

Examples

```
## Maximum stage K=3 with flat mean profiles
K<-3
c10<-rep(10,K)
c01<-rep(10,K)
cn0<-rep(1,K-1)
cn1<-rep(1,K-1)
m0<-rep(0,K)
m1<-rep(2,K)
cov0<-cs(1,0.1,K)
cov1<-ar1(2,0.3,K)
pi<-0.5
int<-c(0.2,0.2,0.8,0.8)
nsim<-5000
utsprt(m0,m1,cov0,cov1,c10,c01,cn0,cn1,pi1,method=1,detail=FALSE,int,nsim)
```

```
## $L0
## [1] 0.1777673 0.1950672 0.5000000
##
## $L1
```

```
## [1] 0.7178870 0.7140405 0.5000000
##
## $EC
## [1] 1.6259
##
## $EN
## [1] 1.5919
##
## $p10
## [1] 0.0916
##
## $p01
## [1] 0.141
##
## $counts
## function gradient
##       18       18
##
## $message
## [1] "CONVERGENCE: REL_REDUCTION_OF_F <= FACTR*EPSMCH"
```