```
## Load libraries
library(splines)
library(MASS)
library(xtable)
library(qvalue)

##Source functions
source("../functions.R")
```

1 Flat functions

Different alternative distributions:

```
alts <- c("alt_beta","alt_chisq_large_3_3","alt_chisq_large",
          "alt_t_large","alt_z_large")
```

Make FDR-TPR tables:

```
for(a in 1:5)
{
  alt <- alts[a]

  print(alt)

  ##For each simulation, get the FDR-TPR table: (BL = Boca-Leek method)
  scen5 <- NULL

  ##-------------------Set 5----------------##

  nr <- 5

  ##don't use Scott methods unless distribution of test statistics is normal or t
  if(a %in% 4:5)
  {
    #Load p-values and £\pi_0(x)£ estimates for the simulations:
    load(paste(alt,"/simResults_", nr, ".RData",sep=""))
    load(paste(alt,"/simResults_pi0x_thresh_", nr, "_splines_full.RData",sep=""))
    load(paste(alt,"/simResults_pi0x_Scott_", nr, "_splines_full.RData",sep=""))
    load(paste(alt,"/simResults_pi0x_Scott_emp_", nr, "_splines_full.RData",sep=""))

  } else {
    load(paste(alt,"/simResults_", 5, ".RData",sep=""))
    load(paste(alt,"/simResults_pi0x_thresh_", 5, "_full.RData",sep=""))
```

```
  FDR.Spl.ScottMat <- NULL
  FDR.Spl.ScottMat_emp <- NULL
}

##Get BH and Storey q-values for each simulation:
qValuesSimsBH <- getQValuesSimsBH(pValuesSims)
qValuesSimsStorey <- getQValuesSimsStorey(pValuesSims)

##Get estimated FDR for each simulation for the final estimates
FDRreg <- getFDRregSims(pi0EstSim, qValuesSimsBH)

##get FDR-TPR table
scen5 <- estFDR.TPR(FDR.BL = FDRreg,
                    FDR.BH = qValuesSimsBH, FDR.Storey = qValuesSimsStorey,
                    FDR.Scott = FDR.Spl.ScottMat, FDR.Scott_emp = FDR.Spl.ScottMat_emp, nu

print("Scenario 5")
print(scen5)

##For each simulation, get the FDR-TPR table: (BL = Boca-Leek method)
scen1 <- NULL

##-------------------Set 1----------------##

nr <- 1

##don't use Scott methods unless distribution of test statistics is normal or t
if(a %in% 4:5)
{
  #Load p-values and £\pi_0(x)£ estimates for the simulations:
  load(paste(alt,"/simResults_", nr, ".RData",sep=""))
  load(paste(alt,"/simResults_pi0x_thresh_", nr, "_splines_full.RData",sep=""))
  load(paste(alt,"/simResults_pi0x_Scott_", nr, "_splines_full.RData",sep=""))
  load(paste(alt,"/simResults_pi0x_Scott_emp_", nr, "_splines_full.RData",sep=""))

} else {
  load(paste(alt,"/simResults_", 1, ".RData",sep=""))
  load(paste(alt,"/simResults_pi0x_thresh_", 1, "_full.RData",sep=""))

  FDR.Spl.ScottMat <- NULL
  FDR.Spl.ScottMat_emp <- NULL
}

##Get BH and Storey q-values for each simulation:
qValuesSimsBH <- getQValuesSimsBH(pValuesSims)
```

```
  qValuesSimsStorey <- getQValuesSimsStorey(pValuesSims)

  ##Get estimated FDR for each simulation for the final estimates
  FDRreg <- getFDRregSims(pi0EstSim, qValuesSimsBH)

  ##get FDR-TPR table
  scen1 <- estFDR.TPR(FDR.BL = FDRreg,
                      FDR.BH = qValuesSimsBH, FDR.Storey = qValuesSimsStorey,
                      FDR.Scott = FDR.Spl.ScottMat, FDR.Scott_emp = FDR.Spl.ScottMat_emp, nu

  print("Scenario 1")
  print(scen1)

  save(list=c("scen1","scen5"),
       file=paste(alt,"FDR_TPR_sims_splines_I_V.RData",sep="/"))
}
```

```
## [1] "alt_beta"
## [1] "Scenario 5"
##                  FDR         TPR Percent used
## BL        0.03509819 0.666023276          100
## Scott             NA          NA           NA
## Scott_emp         NA          NA           NA
## Storey    0.04902803 0.205625136          100
## BH        0.03110532 0.003907651          100
## [1] "Scenario 1"
##                  FDR         TPR Percent used
## BL        0.05000000 0.001951840          100
## Scott             NA          NA           NA
## Scott_emp         NA          NA           NA
## Storey    0.05250000 0.001906795          100
## BH        0.03916667 0.001445886          100
## [1] "alt_chisq_large_3_3"
## [1] "Scenario 5"
##                  FDR       TPR Percent used
## BL        0.04046494 0.6284943          100
## Scott             NA        NA           NA
## Scott_emp         NA        NA           NA
## Storey    0.04596821 0.5525751          100
## BH        0.02381384 0.4616947          100
## [1] "Scenario 1"
##                  FDR       TPR Percent used
## BL        0.05341275 0.3082754          100
## Scott             NA        NA           NA
## Scott_emp         NA        NA           NA
## Storey    0.05395371 0.3058190          100
```

```
## BH        0.04834402 0.2958929          100
## [1] "alt_chisq_large"
## [1] "Scenario 5"
##                  FDR       TPR Percent used
## BL        0.04351032 0.7891245          100
## Scott             NA        NA           NA
## Scott_emp         NA        NA           NA
## Storey    0.04794901 0.7387021          100
## BH        0.02473943 0.6677584          100
## [1] "Scenario 1"
##                  FDR       TPR Percent used
## BL        0.04999166 0.5116271          100
## Scott             NA        NA           NA
## Scott_emp         NA        NA           NA
## Storey    0.04807658 0.5093932          100
## BH        0.04360780 0.4965026          100
## [1] "alt_t_large"
## [1] "Scenario 5"
##                  FDR       TPR Percent used
## BL        0.04459358 0.6829368        100.0
## Scott     0.07578135 0.8054819        100.0
## Scott_emp 0.09436202 0.5072625         99.5
## Storey    0.04749691 0.5706391        100.0
## BH        0.02512397 0.4333298        100.0
## [1] "Scenario 1"
##                  FDR       TPR Percent used
## BL        0.05990968 0.1613972          100
## Scott     0.22768655 0.4871505          100
## Scott_emp 0.24341743 0.4995566          100
## Storey    0.05502398 0.1521425          100
## BH        0.04843184 0.1360035          100
## [1] "alt_z_large"
## [1] "Scenario 5"
##                  FDR       TPR Percent used
## BL        0.04727030 0.8051928        100.0
## Scott     0.04902129 0.8339473        100.0
## Scott_emp 0.24949275 0.7414616         98.5
## Storey    0.04709194 0.7412002        100.0
## BH        0.02437240 0.6708273        100.0
## [1] "Scenario 1"
##                  FDR       TPR Percent used
## BL        0.05105973 0.5123877          100
## Scott     0.05459779 0.5108528          100
## Scott_emp 0.06656970 0.5001171          100
## Storey    0.04876093 0.5081392          100
```

```
## BH        0.04406380 0.4969158          100
```

2 Global null

Nothing from alternative distribution, since this is for the global null:

```
folder <- "global_null"
```

Make FDR-TPR table:

```
print(folder)

## [1] "global_null"

##For each simulation, get the FDR-TPR table: (BL = Boca-Leek method)
scen0 <- NULL

##------------------Set 0---------------##

nr <- 0

#Load p-values and £\pi_0(x)£ estimates for the simulations:
load(paste(folder,"/simResults_", nr, ".RData",sep=""))
load(paste(folder,"/simResults_pi0x_thresh_", nr, "_splines_full.RData",sep=""))
load(paste(folder,"/simResults_pi0x_Scott_", nr, "_splines_full.RData",sep=""))
load(paste(folder,"/simResults_pi0x_Scott_emp_", nr, "_splines_full.RData",sep=""))

##Get BH and Storey q-values for each simulation:
qValuesSimsBH <- getQValuesSimsBH(pValuesSims)
qValuesSimsStorey <- getQValuesSimsStorey(pValuesSims)

print(mean(qValuesSimsStorey))

## [1] 0.9283267

##Get estimated FDR for each simulation for the final estimates
FDRreg <- getFDRregSims(pi0EstSim, qValuesSimsBH)

##get FDR-TPR table
scen0 <- estFDR.TPR(FDR.BL = FDRreg,
                    FDR.BH = qValuesSimsBH, FDR.Storey = qValuesSimsStorey,
                    FDR.Scott = FDR.Spl.ScottMat, FDR.Scott_emp = FDR.Spl.ScottMat_emp, null

print("Scenario 0")
```

```
## [1] "Scenario 0"

print(scen0)

##                 FDR TPR Percent used
## BL        0.0530000   0        100.0
## Scott     0.0210000   0        100.0
## Scott_emp 0.2233503   0         98.5
## Storey    0.0500000   0        100.0
## BH        0.0450000   0        100.0

save(list=c("scen0"),
     file=paste(folder,"FDR_TPR_sims_additional_global_splines.RData",sep="/"))
```

Session info:

```
devtools::session_info()

## Session info -------------------------------------------------

##  setting  value
##  version  R version 3.3.1 (2016-06-21)
##  system   x86_64, mingw32
##  ui       RTerm
##  language (EN)
##  collate  English_United States.1252
##  tz       America/New_York
##  date     2018-09-20

## Packages -----------------------------------------------------

##  package    * version date       source
##  colorspace   1.2-6   2015-03-11 CRAN (R 3.3.1)
##  devtools     1.12.0  2016-06-24 CRAN (R 3.3.3)
##  digest       0.6.12  2017-01-27 CRAN (R 3.3.3)
##  evaluate     0.10    2016-10-11 CRAN (R 3.3.1)
##  ggplot2      2.2.1   2016-12-30 CRAN (R 3.3.3)
##  gtable       0.2.0   2016-02-26 CRAN (R 3.3.1)
##  highr        0.6     2016-05-09 CRAN (R 3.3.1)
##  knitr      * 1.17    2017-08-10 CRAN (R 3.3.3)
##  lazyeval     0.2.0   2016-06-12 CRAN (R 3.3.1)
##  magrittr     1.5     2014-11-22 CRAN (R 3.3.1)
##  MASS       * 7.3-45  2016-04-21 CRAN (R 3.3.1)
##  memoise      1.0.0   2016-01-29 CRAN (R 3.3.1)
##  munsell      0.4.3   2016-02-13 CRAN (R 3.3.1)
##  plyr         1.8.4   2016-06-08 CRAN (R 3.3.1)
##  qvalue     * 2.4.2   2016-05-16 Bioconductor
```

```
##  Rcpp         0.12.13 2017-09-28 CRAN (R 3.3.3)
##  reshape2     1.4.1   2014-12-06 CRAN (R 3.3.1)
##  rlang        0.1.4   2017-11-05 CRAN (R 3.3.3)
##  scales       0.4.1   2016-11-09 CRAN (R 3.3.3)
##  stringi      1.1.1   2016-05-27 CRAN (R 3.3.0)
##  stringr      1.2.0   2017-02-18 CRAN (R 3.3.3)
##  tibble       1.3.3   2017-05-28 CRAN (R 3.3.3)
##  withr        1.0.2   2016-06-20 CRAN (R 3.3.1)
##  xtable     * 1.8-2   2016-02-05 CRAN (R 3.3.1)
```