

```

## Load libraries
library(splines)
library(MASS)

library(doParallel) ##to make cluster (on Windows)

## Loading required package: foreach
## Loading required package: iterators
## Loading required package: parallel

library(foreach) ##to use foreach function that does the parallel processing
library(doRNG) ##for reproducible seeds when doing parallel processing

## Loading required package: rngtools
## Loading required package: pkgmaker
## Loading required package: registry
##
## Attaching package: 'pkgmaker'
## The following object is masked from 'package:base':
##
##   isNamespaceLoaded

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

## Define the number of tests
ntest <- 10000

## Set number of simulations
nSims <- 200

```

Do the simulations for a variety of alternative distributions:

```

alts <- c("alt_beta", "alt_chisq_large_3_3", "alt_chisq_large",
          "alt_chisq_small_3_3", "alt_chisq_small",
          "alt_t_large", "alt_t_small",
          "alt_z_large",
          "alt_z_small")

```

1 Probability of being a false positive is flat

```

## Set up the time vector and the probability of being null
tme <- seq(0,1, length=ntest)
pi0 <- rep(0.9, length=ntest)

```

```

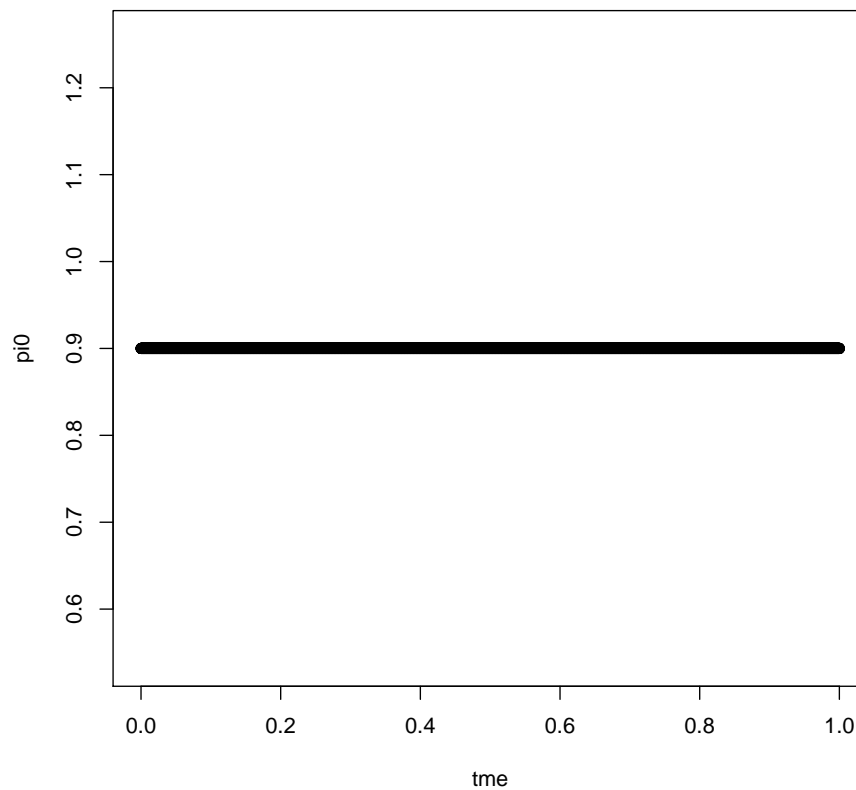
plot(pi0 ~ tme)

for(alt in alts)
{
  pValuesSims <- run_sims_alt(alt, nSims, pi0)

  zValuesSims <- pValuesSims[, (2*ntest+1):(3*ntest)]
  nullHypSims <- pValuesSims[, (ntest+1):(2*ntest)]
  pValuesSims <- pValuesSims[, 1:ntest]

  ##save results
  save(file=paste(alt, "simResults_1.RData", sep="/"),
        list=c("pi0", "tme", "nullHypSims", "pValuesSims", "zValuesSims"))
}

```



2 Probability of being a false positive is smooth in one variable

```
## Set up the time vector and the probability of being null
tme <- seq(0,1, length=ntest)
pi0 <- fSingle(tme)

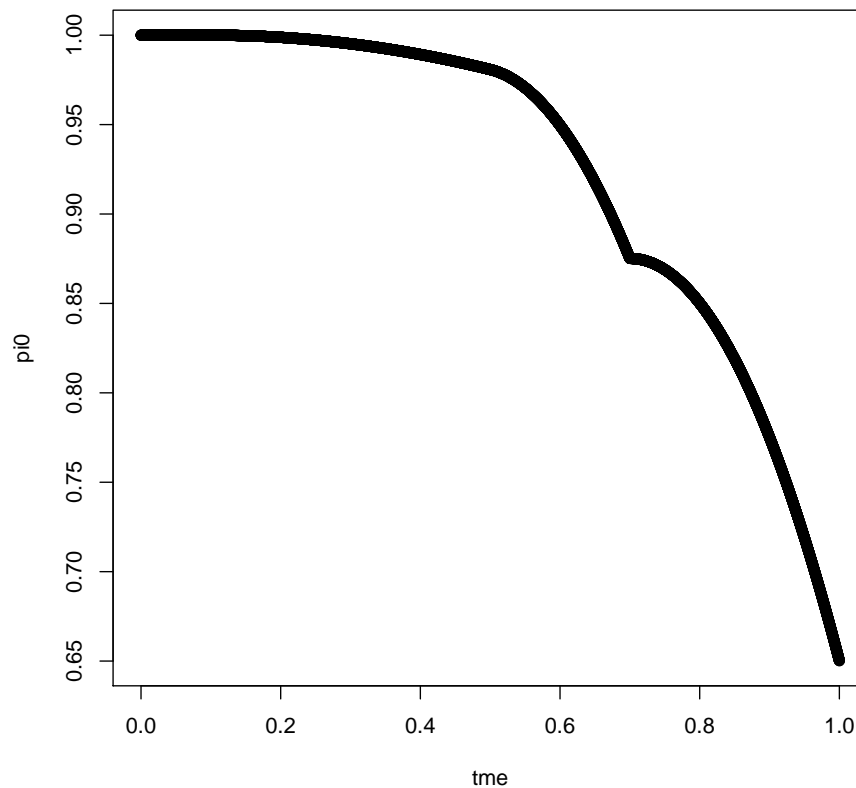
plot(pi0 ~ tme)

for(alt in alts)
{
  pValuesSims <- run_sims_alt(alt, nSims, pi0)

  dim(pValuesSims)

  zValuesSims <- pValuesSims[(2*ntest+1):(3*ntest)]
  nullHypSims <- pValuesSims[(ntest+1):(2*ntest)]
  pValuesSims <- pValuesSims[1:ntest]

  ##save results
  save(file=paste(alt, "simResults_2.RData", sep="/"),
        list=c("pi0", "tme", "nullHypSims", "pValuesSims", "zValuesSims"))
}
```



3 Probability of being a false positive is smooth in one variable within levels of second variable

```
## Set up the time vector and the probability of being null
tme1 <- seq(0,1,length=ntest)
tme2cont <- runif(ntest,0,0.5)
set.seed(309441)
tme2 <- rep(NA, ntest)
tme2[tme2cont < 0.127] <- 1
tme2[tme2cont >= 0.127] <- 2
tme2[tme2cont >= 0.302] <- 3
pi0 <- f(tme1, tme2)
range(pi0)
```

```

## [1] 0.6503073 1.0000000

plot(pi0 ~ tme1)

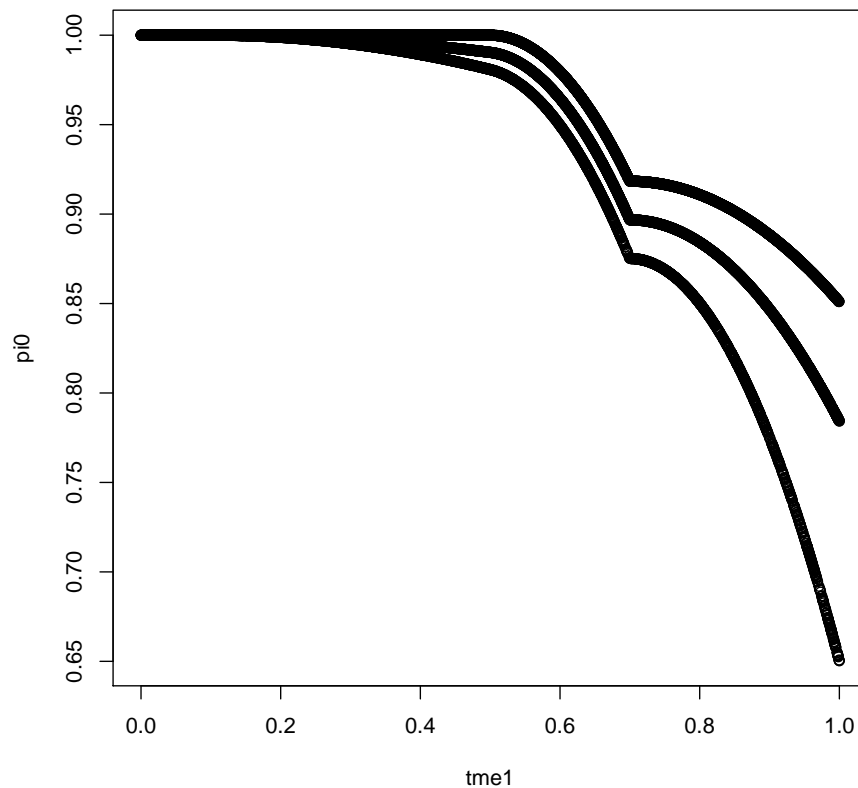
for(alt in alts)
{
  pValuesSims <- run_sims_alt(alt, nSims, pi0)

  dim(pValuesSims)

  zValuesSims <- pValuesSims[(2*ntest+1):(3*ntest)]
  nullHypSims <- pValuesSims[(ntest+1):(2*ntest)]
  pValuesSims <- pValuesSims[1:ntest]

  ##save results
  save(file=paste(alt, "simResults_3.RData", sep="/"),
        list=c("pi0", "tme1", "tme2", "nullHypSims", "pValuesSims", "zValuesSims"))
}

```



- 4 Probability of being a false positive is smooth in one variable within levels of second variable - lower priors

```
## Set up the time vector and the probability of being null
tme1 <- seq(0,1,length=ntest)
tme2cont <- runif(ntest,0,0.5)
set.seed(309441)
tme2 <- rep(NA, ntest)
tme2[tme2cont < 0.127] <- 1
tme2[tme2cont >= 0.127] <- 2
tme2[tme2cont >= 0.302] <- 3
pi0 <- 0.6*f(tme1, tme2)
```

```

range(pi0)

## [1] 0.3901844 0.6000000

plot(pi0 ~ tme1)

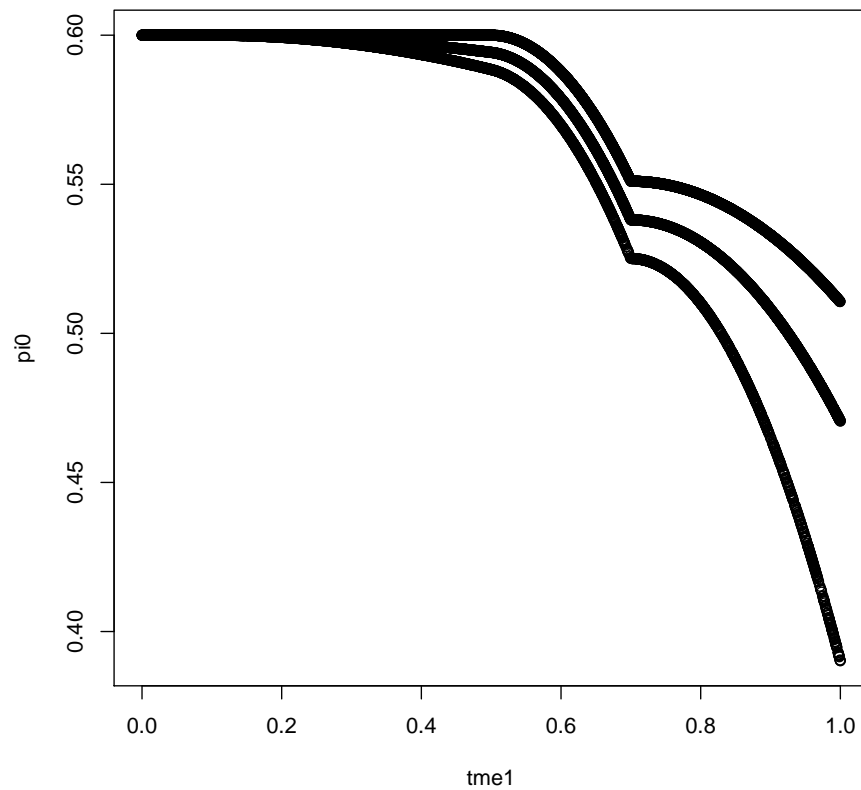
for(alt in alts)
{
  pValuesSims <- run_sims_alt(alt, nSims, pi0)

  dim(pValuesSims)

  zValuesSims <- pValuesSims[, (2*ntest+1):(3*ntest)]
  nullHypSims <- pValuesSims[, (ntest+1):(2*ntest)]
  pValuesSims <- pValuesSims[, 1:ntest]

  ##save results
  save(file=paste(alt, "simResults_4.RData", sep="/"),
        list=c("pi0", "tme1", "tme2", "nullHypSims", "pValuesSims", "zValuesSims"))
}

```



Session info:

```
devtools::session_info()
```

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

```
## setting  value
## version  R version 3.4.0 (2017-04-21)
## system   x86_64, mingw32
## ui        RTerm
## language (EN)
## collate   English_United States.1252
## tz        America/New_York
## date      2017-06-13
```

```
## Packages -----
```

```
## package * version date      source
```


##	codetools	0.2-15	2016-10-05	CRAN	(R 3.4.0)
##	devtools	1.12.0	2016-12-05	CRAN	(R 3.4.0)
##	digest	0.6.12	2017-01-27	CRAN	(R 3.4.0)
##	doParallel	* 1.0.10	2015-10-14	CRAN	(R 3.4.0)
##	doRNG	* 1.6.6	2017-04-10	CRAN	(R 3.4.0)
##	evaluate	0.10	2016-10-11	CRAN	(R 3.4.0)
##	foreach	* 1.4.3	2015-10-13	CRAN	(R 3.4.0)
##	highr	0.6	2016-05-09	CRAN	(R 3.4.0)
##	iterators	* 1.0.8	2015-10-13	CRAN	(R 3.4.0)
##	knitr	* 1.15.1	2016-11-22	CRAN	(R 3.4.0)
##	magrittr	1.5	2014-11-22	CRAN	(R 3.4.0)
##	MASS	* 7.3-47	2017-02-26	CRAN	(R 3.4.0)
##	memoise	1.1.0	2017-04-21	CRAN	(R 3.4.0)
##	pkgmaker	* 0.22	2014-05-14	CRAN	(R 3.4.0)
##	registry	* 0.3	2015-07-08	CRAN	(R 3.4.0)
##	rngtools	* 1.2.4	2014-03-06	CRAN	(R 3.4.0)
##	stringi	1.1.5	2017-04-07	CRAN	(R 3.4.0)
##	stringr	1.2.0	2017-02-18	CRAN	(R 3.4.0)
##	withr	1.0.2	2016-06-20	CRAN	(R 3.4.0)
##	xtable	1.8-2	2016-02-05	CRAN	(R 3.4.0)