

```

## 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
## Warning:  package 'rngtools' was built under R version 3.3.2
## Loading required package:  pkgmaker
## Warning:  package 'pkgmaker' was built under R version 3.3.2
## Loading required package:  registry
## Warning:  package 'registry' was built under R version 3.3.2
##
## Attaching package:  'pkgmaker'
## The following object is masked from 'package:base':
##
##      isNamespaceLoaded

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

## Define the number of tests
ntest <- 1000

## 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  $x^{5/4}$

```

## Set up the time vector and the probability of being null
tme <- seq(0,1, length=ntest)
pi0 <- tme^(5/4)

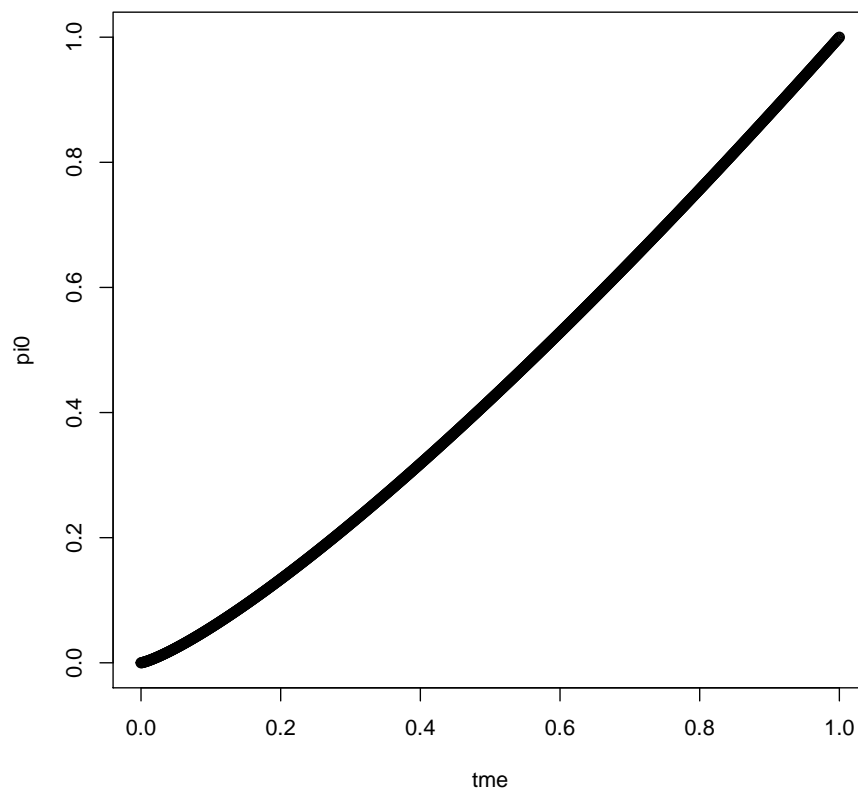
plot(pi0 ~ tme)

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_9.RData", sep="/"),
        list=c("pi0", "tme", "nullHypSims", "pValuesSims", "zValuesSims"))
}

```



## 2 Probability of being a false positive is $x^{3/2}$

```
## Set up the time vector and the probability of being null
tme <- seq(0,1, length=ntest)
pi0 <- tme^(3/2)

plot(pi0 ~ tme)

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

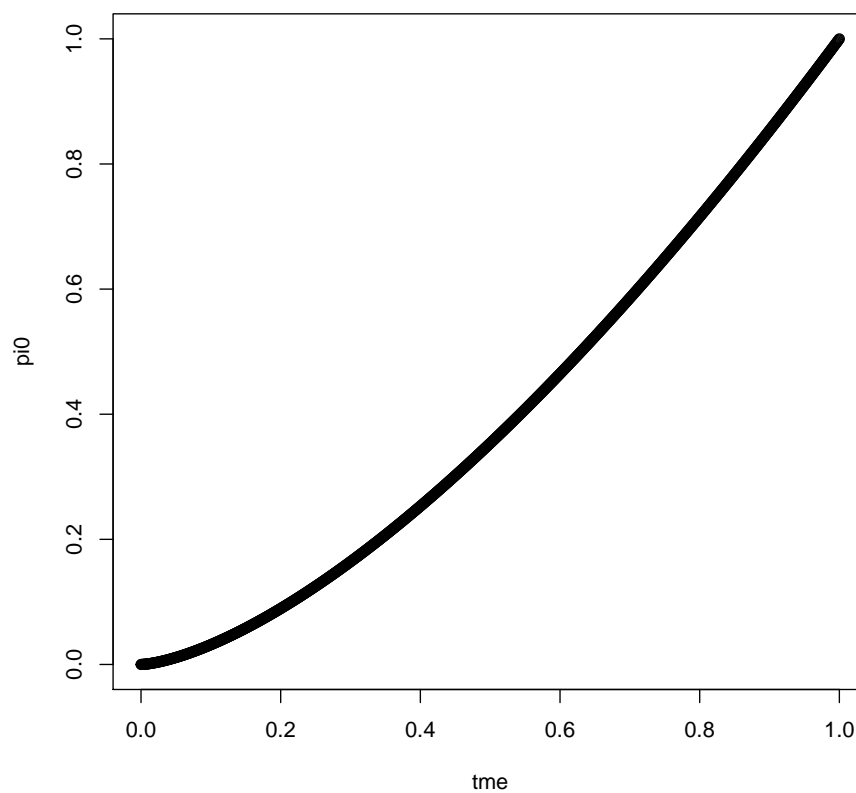
  zValuesSims <- pValuesSims[(2*ntest+1):(3*ntest)]
  nullHypSims <- pValuesSims[(ntest+1):(2*ntest)]
}
```

```

pValuesSims <- pValuesSims[,1:nTest]

##save results
save(file=paste(alt, "simResults_10.RData", sep="/"),
      list=c("pi0", "tme", "nullHypSims", "pValuesSims", "zValuesSims"))
}

```



### 3 Probability of being a false positive is quadratic

```

## Set up the time vector and the probability of being null
tme <- seq(0,1, length=nTest)
pi0 <- tme^2

plot(pi0 ~ tme)

```

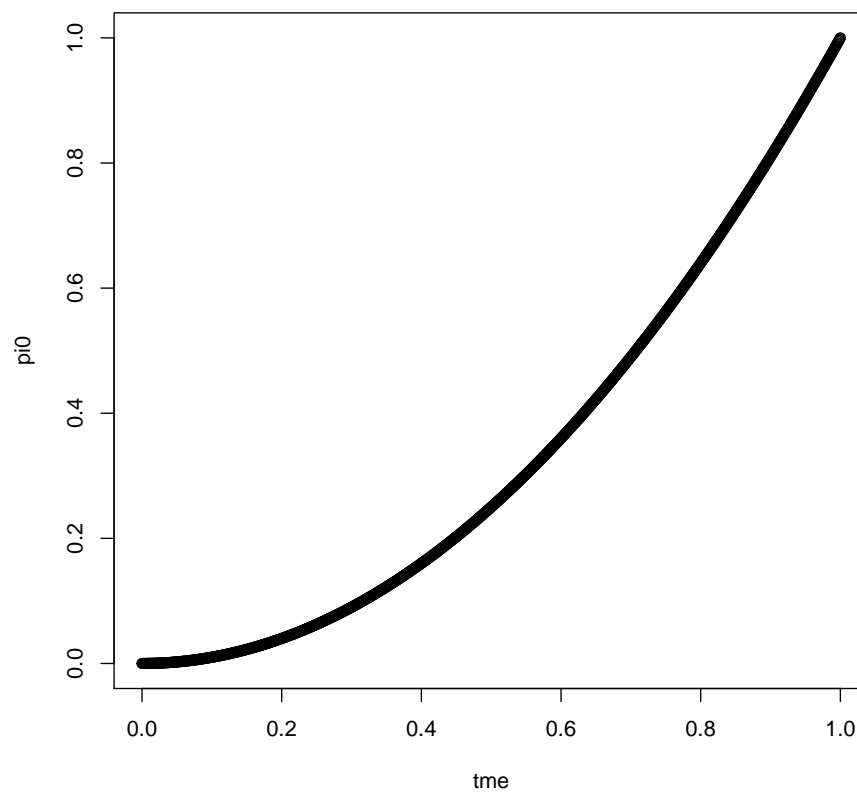
```

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_11.RData", sep="/"),
        list=c("pi0", "tme", "nullHypSims", "pValuesSims", "zValuesSims"))
}

```



## 4 Probability of being a false positive is cubic

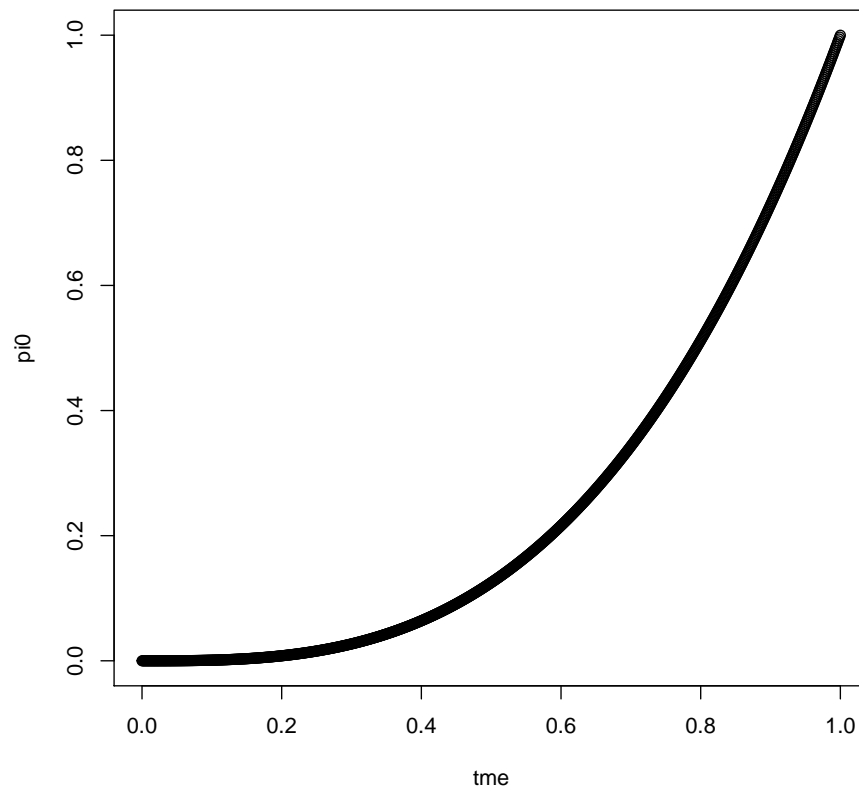
```
## Set up the time vector and the probability of being null
tme <- seq(0,1, length=ntest)
pi0 <- tme^3

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_12.RData", sep="/"),
        list=c("pi0", "tme", "nullHypSims", "pValuesSims", "zValuesSims"))
}
```



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     2018-08-29

## Packages -----
## package    * version date      source
```

##	codetools	0.2-14	2015-07-15	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)
##	doParallel	* 1.0.10	2015-10-14	CRAN	(R 3.3.1)
##	doRNG	* 1.6	2014-03-07	CRAN	(R 3.3.1)
##	evaluate	0.10	2016-10-11	CRAN	(R 3.3.1)
##	foreach	* 1.4.3	2015-10-13	CRAN	(R 3.3.1)
##	highr	0.6	2016-05-09	CRAN	(R 3.3.1)
##	iterators	* 1.0.8	2015-10-13	CRAN	(R 3.3.0)
##	knitr	* 1.17	2017-08-10	CRAN	(R 3.3.3)
##	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)
##	pkgmaker	* 0.22	2014-05-14	CRAN	(R 3.3.2)
##	registry	* 0.3	2015-07-08	CRAN	(R 3.3.2)
##	rngtools	* 1.2.4	2014-03-06	CRAN	(R 3.3.2)
##	stringi	1.1.1	2016-05-27	CRAN	(R 3.3.0)
##	stringr	1.2.0	2017-02-18	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)