Change Point

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September 23, 2016

Load all the necessary package and algorithm.

Simulation

First we test the simulation without any covariate, so that $Y_i \sim N(\mu_i, \sigma^2)$

Setting 1

```
##Settings
n=1000
sigma=0.5
p=0
K=12
break_point = c(10, 13, 15, 23, 25, 40, 44, 65, 76, 78, 81)*n/100
Beta = matrix(c(0, 40,-10, 20,-20, 30,-12,  9, 52, 21, 42,  0)/20 -0.8,nrow=1,byrow = TRUE)
```

```
##                                  FDR    PDR    FDR    PDR
## SIFS            0.0044 0.0121 0.2161 0.7967 0.1137 0.9008
## SIFS_normalized 0.0139 0.0099 0.2218 0.7475 0.1141 0.8508
## LS_TV1          0.0047 0.0090 0.1367 0.8633 0.0525 0.9450
## LS_TV2          0.0119 0.0089 0.1275 0.8383 0.0449 0.9167
##                                  FDR    PDR    FDR    PDR
## SIFS            0.0051 0.0256 0.1096 0.1094 0.0881 0.0884
## SIFS_normalized 0.0094 0.0252 0.1126 0.1127 0.0878 0.0920
## LS_TV1          0.0071 0.0251 0.1036 0.1036 0.0666 0.0683
## LS_TV2          0.0093 0.0307 0.1029 0.1058 0.0679 0.0670
```

Setting 2

```
##Settings
n=1000
sigma=0.5
p=0
K=12
break_point = c(10, 13, 15, 23, 25, 40, 44, 65, 76, 78, 81)*n/100
Beta = matrix(c(0, 40,-10, 20,-20, 30,-12,  9, 52, 21, 42,  0)/20 -0.8,nrow=1,byrow = TRUE)
```

```
##                                  FDR    PDR    FDR    PDR
## SIFS            0.0045 0.0081 0.2383 0.7742 0.1208 0.8933
## SIFS_normalized 0.0133 0.0082 0.2371 0.7300 0.1242 0.8392
## LS_TV1          0.0057 0.0139 0.1425 0.8575 0.0575 0.9392
## LS_TV2          0.0115 0.0041 0.1187 0.8367 0.0336 0.9183
```

```
##                                 FDR    PDR    FDR    PDR
## SIFS            0.0044 0.0120 0.1146 0.1168 0.0810 0.0795
## SIFS_normalized 0.0092 0.0188 0.1286 0.1197 0.0856 0.0848
## LS_TV1          0.0071 0.0328 0.0832 0.0832 0.0667 0.0669
## LS_TV2          0.0092 0.0203 0.0864 0.0837 0.0504 0.0638
```

Setting 3

```
##Settings
n=200
sigma=0.05
p=0
K=12
break_point = c(10, 13, 15, 23, 25, 40, 44, 65, 76, 78, 81)*n/100
Beta = matrix(c(0, 40,-10, 20,-20, 30,-12,  9, 52, 21, 42,  0)/20 -0.8,nrow=1,byrow = TRUE)
```

```
##                                 FDR    PDR    FDR    PDR
## SIFS            0.0000 0.0104 0.0170 1.0000 0.0170 1.0000
## SIFS_normalized 0.0000 0.0076 0.0077 1.0000 0.0077 1.0000
## LS_TV1          0.0164 0.0401 0.0683 0.9317 0.0483 0.9317
## LS_TV2          0.0000 0.0571 0.1087 0.9992 0.0819 1.0000
##                                 FDR    PDR    FDR    PDR
## SIFS            0.0000 0.0252 0.0395 0.0000 0.0395 0.0000
## SIFS_normalized 0.0000 0.0273 0.0232 0.0000 0.0232 0.0000
## LS_TV1          0.0077 0.0370 0.0322 0.0322 0.0413 0.0322
## LS_TV2          0.0005 0.0506 0.0742 0.0083 0.0703 0.0000
```

Setting 4

```
##Settings
n=1000
sigma=0.1
p=0
K=12
break_point = c(10, 13, 15, 23, 25, 40, 44, 65, 76, 78, 81)*n/100
Beta = matrix(c(0, 40,-10, 20,-20, 30,-12,  9, 52, 21, 42,  0)/200 -0.8,nrow=1,byrow = TRUE)
```

```
##                                 FDR    PDR    FDR    PDR
## SIFS            0.0205 0.0212 0.4654 0.5158 0.2998 0.6758
## SIFS_normalized 0.0342 0.0150 0.4356 0.4558 0.2780 0.5850
## LS_TV1          0.0254 0.0930 0.4750 0.5250 0.3133 0.6800
## LS_TV2          0.2340 0.0033 0.3336 0.3017 0.1460 0.3817
##                                 FDR    PDR    FDR    PDR
## SIFS            0.0131 0.0211 0.1200 0.1159 0.1151 0.1098
## SIFS_normalized 0.0211 0.0153 0.1512 0.1216 0.1358 0.1190
## LS_TV1          0.0130 0.0641 0.1306 0.1306 0.1287 0.1285
## LS_TV2          0.2012 0.0041 0.2001 0.1323 0.1449 0.1351
```