Simulating Age-Period-Cohort Data
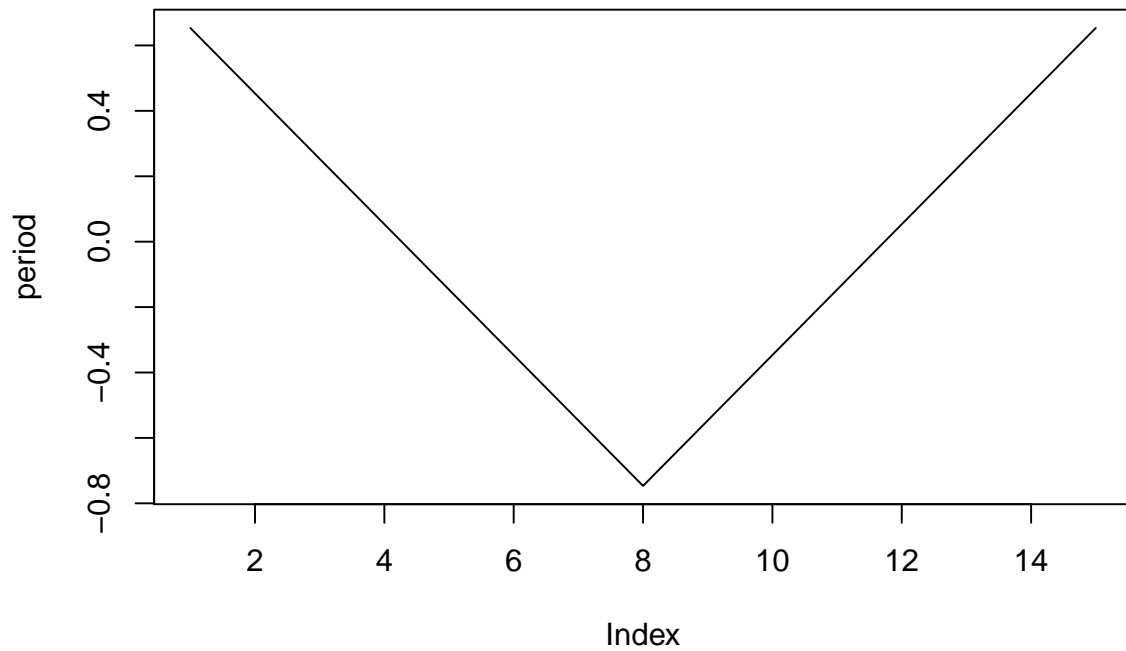
Volker Schmid

2020-01-10

```
age=2*sqrt(seq(1,20,length=10))
age<- age-mean(age)
plot(age, type="l")
```
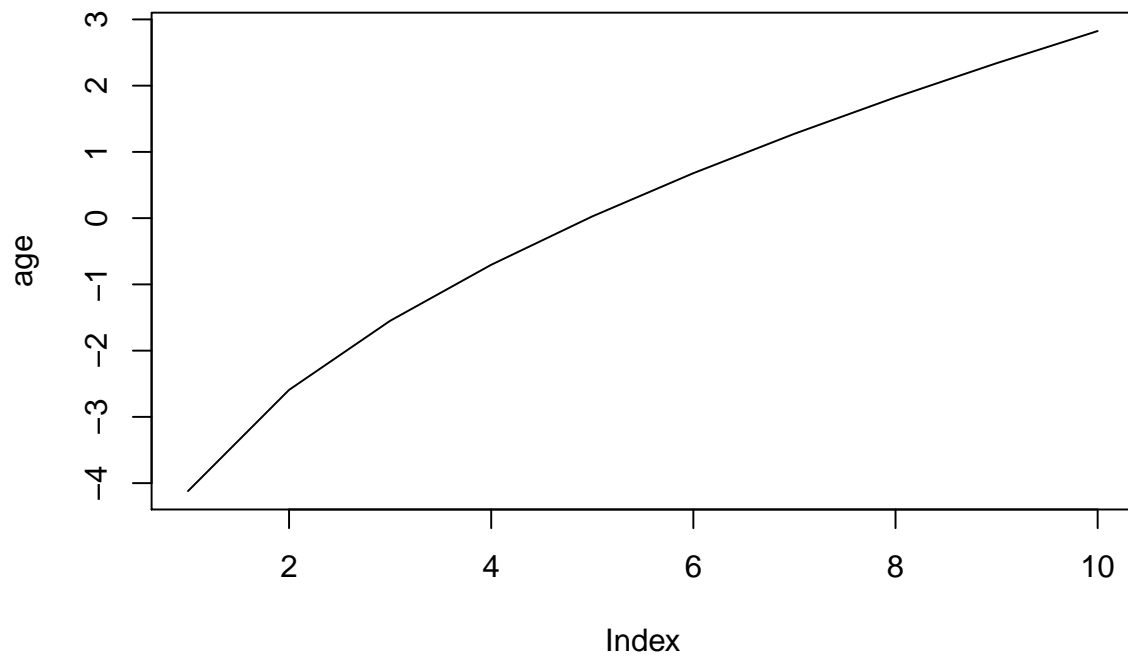


```
period=15:1
period[8:15]<-8:15
period<-period/5
period<-period-mean(period)
plot(period, type="l")
```

```
periods_per_agegroup=5
number_of_cohorts <- periods_per_agegroup*(10-1)+15
cohort<-rep(0,60)
cohort[1:15]<-(14:0)
cohort[16:30]<- (1:15)/2
cohort[31:60]<- 8
cohort<-cohort/10
cohort<-cohort-mean(cohort)
plot(cohort, type="l")
```
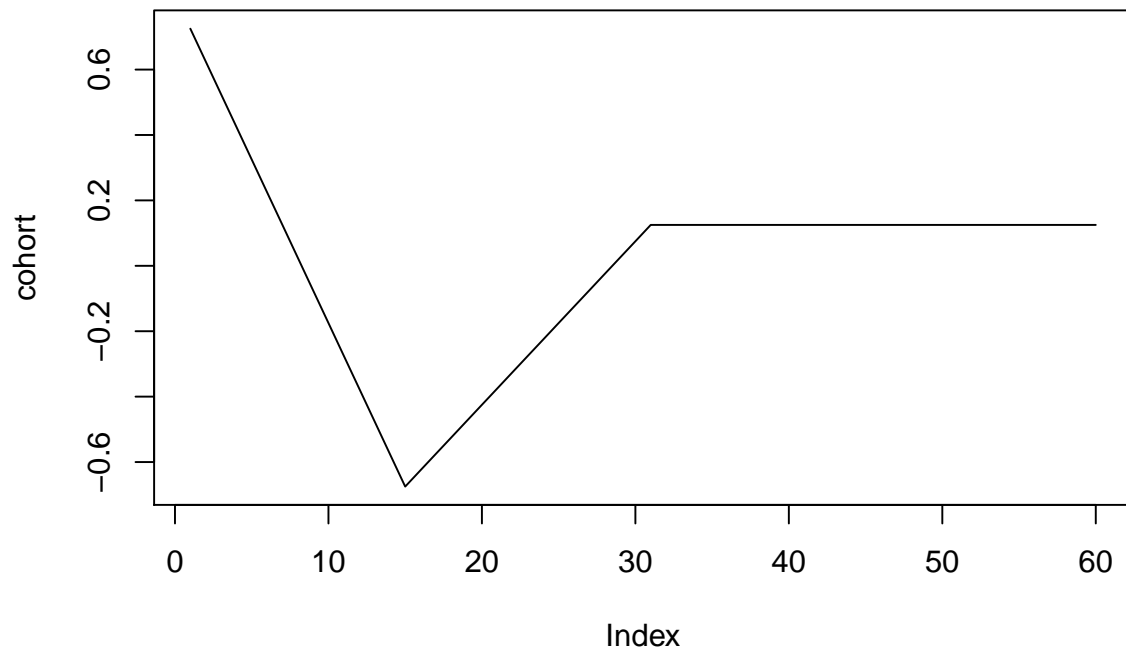


```
simdata<-apcSimulate(-10, age, period, cohort, periods_per_agegroup, 1e6)
print(simdata$cases)
```

```
##      [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10]
## [1,]    1    7   22   58   89  108  176  462 1127  3053
## [2,]    3    7   16   50   61  103  149  290  859  2211
## [3,]    1    4   20   33   70  108  118  204  599  1622
## [4,]    0    3   10   37   39   63  120  155  528  1201
## [5,]    2    3    9   18   42   69  102  119  365   887
## [6,]    0    2    7   24   43   50   87  113  242   716
## [7,]    0    3    8   15   36   61   73   87  193   492
## [8,]    2    4    2   11   29   32   54   64  149   352
## [9,]    0    3    4   19   18   39   69  105  151   428
## [10,]   1    1   11   22   43   70  110  130  168   438
## [11,]   1    5    4   22   37   90  118  176  216   501
## [12,]   1    5   12   19   65  106  143  214  291   536
## [13,]   0    4   16   24   60  108  201  263  378   614
## [14,]   3    7   17   37   83  177  276  353  468   682
## [15,]   1    3   28   37   91  185  311  470  624   694
```

```r
simmod <- bamp(cases = simdata$cases, population = simdata$population, age = "rw1",
period = "rw1", cohort = "rw1", periods_per_agegroup =periods_per_agegroup)
```

```r
print(simmod)
```

```
##
##  Model:
## age (rw1)  - period (rw1)  - cohort (rw1) model
## Deviance:     157.03
## pD:            49.45
## DIC:          206.48
##
##
##  Hyper parameters:              5%        50%        95%
## age                          0.703      1.644      3.379
## period                      12.596     24.253     42.228
## cohort                      73.100    116.612    181.359
```

```r
checkConvergence(simmod)
```

```
## [1] TRUE
```

```r
plot(simmod)
```

age
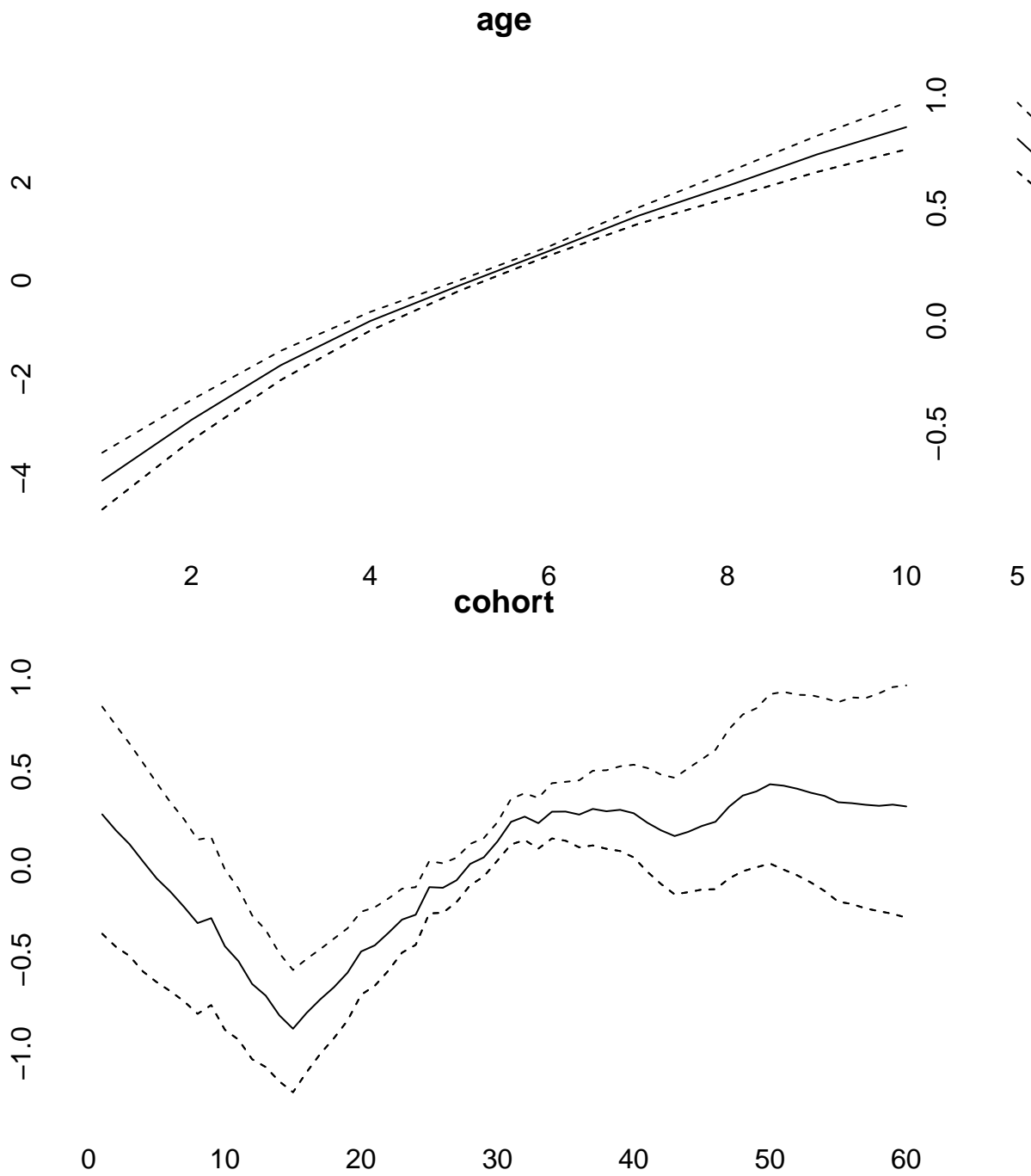
cohort


```
effects<-effects(simmod)
effects2<-effects(simmod, mean=TRUE)
#par(mfrow=c(3,1))
plot(age, type="l")
lines(effects$age, col="blue")
lines(effects2$age, col="green")
```

4
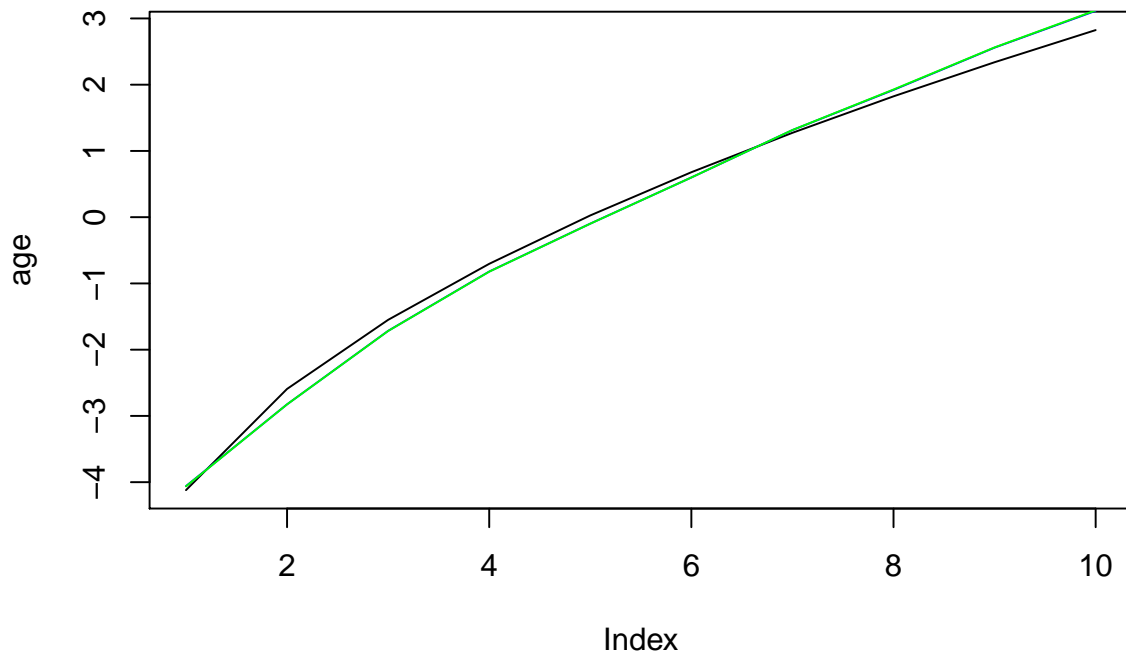
```r
plot(period, type="l")
lines(effects$period, col="blue")
lines(effects2$period, col="green")
```
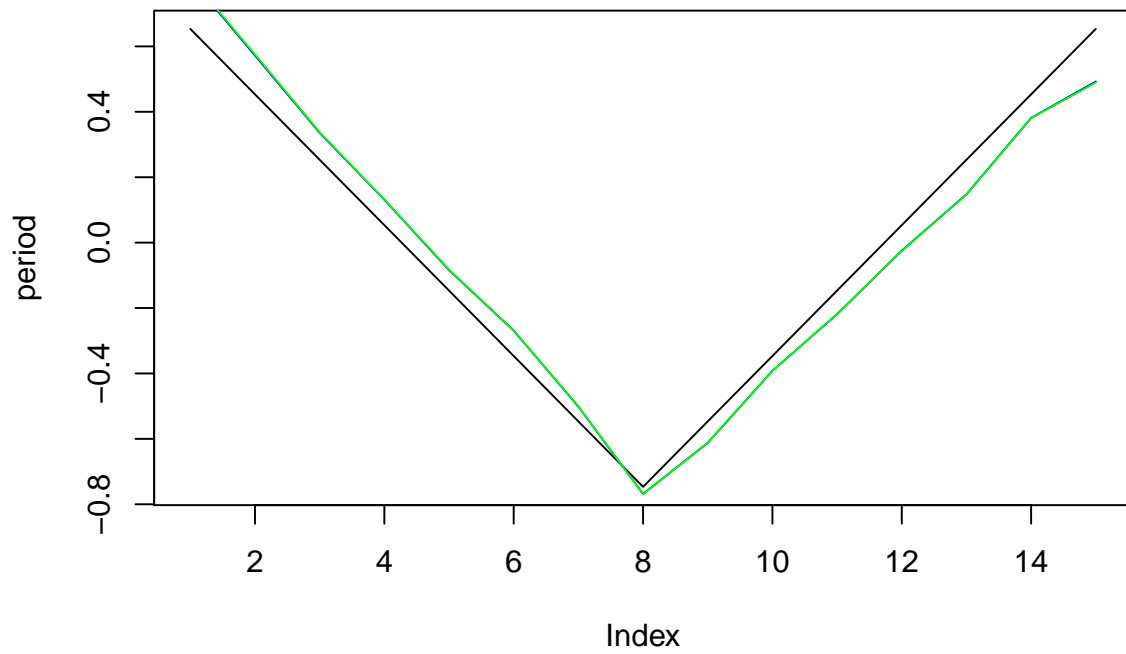


```r
plot(cohort, type="l")
lines(effects$cohort, col="blue")
lines(effects2$cohort, col="green")
```
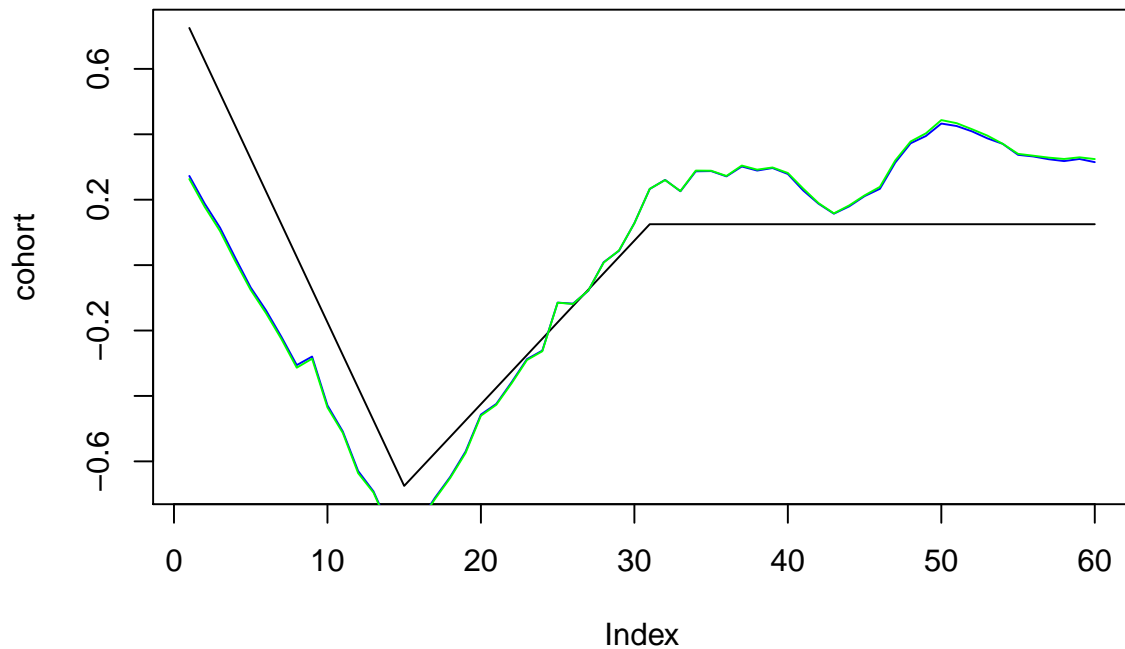
```r
prediction<-predict_apc(simmod, periods=5, population=array(1e6,c(20,10)))
```

```r
plot(prediction$cases_period[2,], ylim=range(prediction$cases_period),ylab="",pch=19)
points(prediction$cases_period[1,],pch="-",cex=2)
```

```
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points(prediction$cases_period[3,],pch="-",cex=2)

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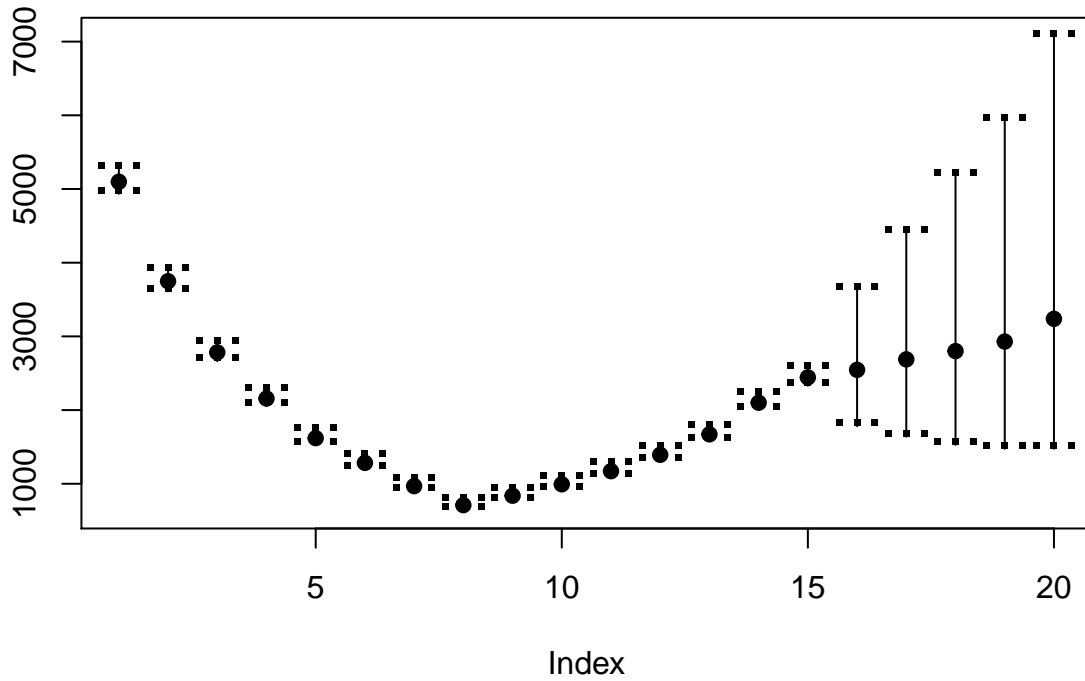
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for (i in 1:20)lines(rep(i,3),prediction$cases_period[,i])
```
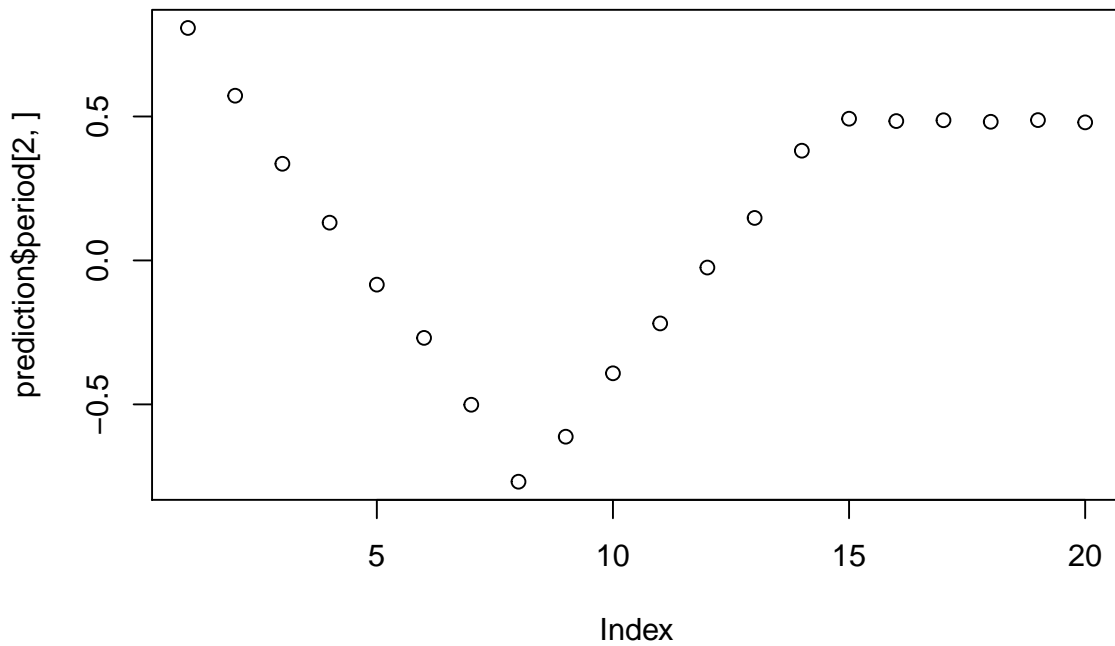
```r
plot(prediction$period[2,])
```



```r
simmodrw2 <- bamp(cases = simdata$cases, population = simdata$population, age = "rw2",
period = "rw2", cohort = "rw2", periods_per_agegroup =periods_per_agegroup)
```

```r
print(simmodrw2)
```

```
##
##  Model:
## age (rw2)  - period (rw2)  - cohort (rw2) model
## Deviance:      168.38
## pD:            31.80
```
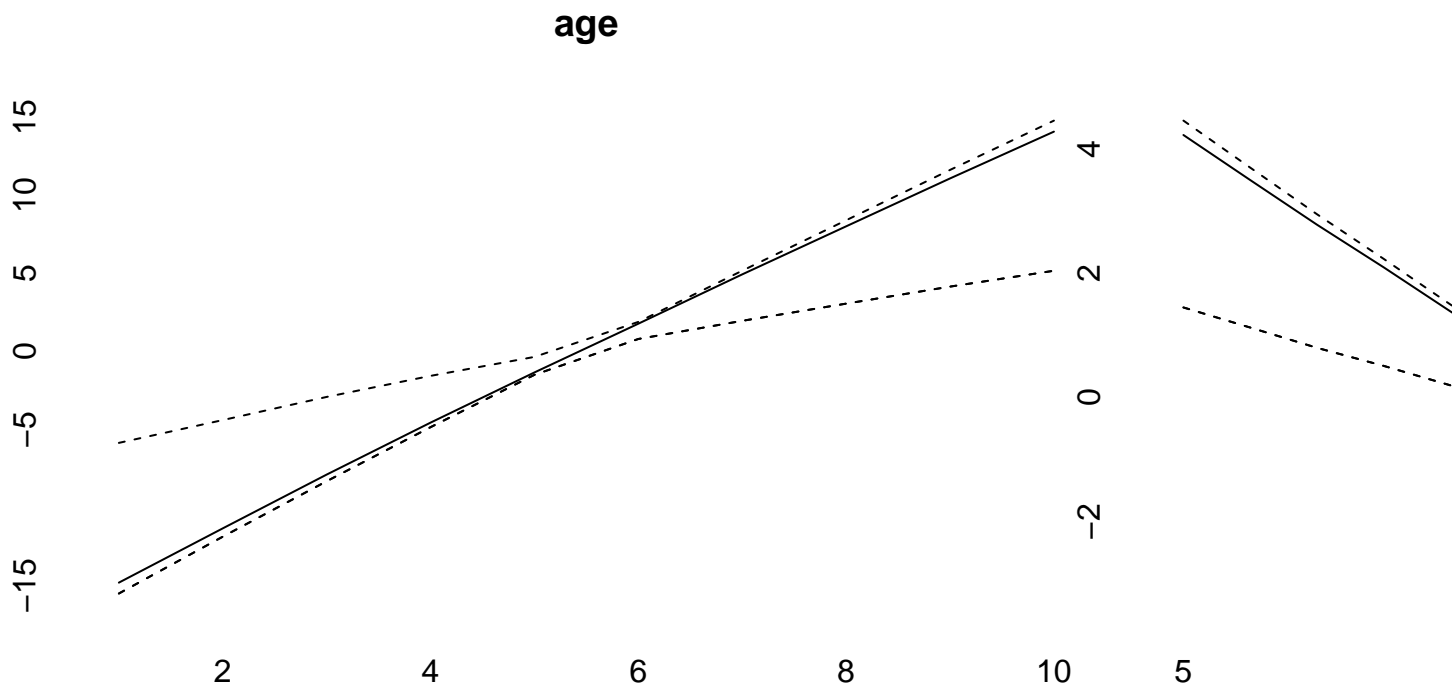
```
## DIC:            200.18
##
##
##   Hyper parameters:                5%         50%         95%
## age                           41.309     149.522     527.684
## period                        40.726      93.430     201.117
## cohort                       437.853    1003.113    2052.161
```

```
checkConvergence(simmodrw2)
```

```
## Warning: MCMC chains did not converge!
```

```
## [1] FALSE
```

```
plot(simmodrw2)
```

age
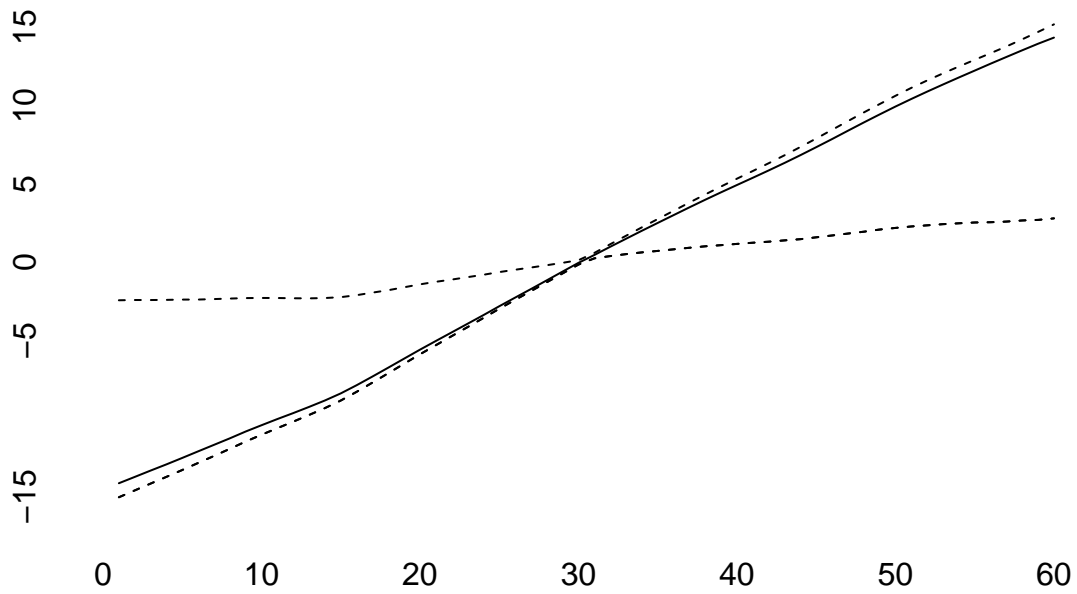
cohort


```
cov_p<-rnorm(15,period,.1)
```

```
simmod2 <- bamp(cases = simdata$cases, population = simdata$population, age = "rw1",
period = "rw1", cohort = "rw1", periods_per_agegroup =periods_per_agegroup,
period_covariate = cov_p)
```