The unemployment data from catdata are loaded.

```r
library(catdata)
data(unemployment, package="catdata")
attach(unemployment)
```

The GAM is fitted by using the library "mgcv".

```r
library(mgcv)

durbin[durbin==2] <- 0
gamage <- gam(durbin ~ s(age, bs="ps", m=c(2,1), k=15), family=binomial())
```

To plot the fitted probabilities for the whole range of age probabilities have to be predicted.

```r
minage <- min(age)
maxage <- max(age)
ageindex <- seq(from=minage, to=maxage, by=0.01)
pred <- predict(gamage, newdata=data.frame("age"=ageindex), type="response")
```

The following function describes the code for B–Splines.

```r
bspline<-function(x,k,i,m=2)
{if (m==1)
 {res<-as.numeric(x<k[i+1]&x>=k[i])}
 else{
  z0<-(x-k[i])/(k[i+m+1]-k[i])
  z1<-(k[i+m+2]-x)/(k[i+m+2]-k[i+1])
  res<- z0*bspline(x,k,i,m-1)+z1*bspline(x,k,i+1,m-1)
  res
  }
}
```

Now the knots for the B–Splines are defined, furthermore for each age the corresponding mean of durbin is computed.
k <- gamage$smooth[[1]]$knots

meanage <- c()

for (i in minage:maxage){
    meanage[i] <- sum(durbin[age==i])
    if(sum(durbin[age==i])!=0){
        meanage[i] <- mean(durbin[age==i])
    }
}

Now the line for the predicted probabilities, the B–Splines and the corresponding means for each age are plotted.

par(cex=1.3, lwd=1.5)
plot(ageindex, pred, type="l", ylim=c(0,0.8), col="gray", xlab="age/years",
    ylab="short-term unemployment")
for(i in 1:15)
    lines(ageindex,(0.5*gamage$coefficients[i+1]+0.7)*(bspline(x=ageindex,k=k,
        i=i+1,m=2)),type="l", col="gray")
points(minage:maxage, meanage[minage:maxage], pch=20)

Via the option "fx=TRUE" a unpenalized gam is fitted, afterwards again the probabilities for the whole range of age are computed.

gamage2 <- gam(durbin ~ s(age, bs="ps", fx=TRUE, m=c(2,1),k=15), family=binomial())
pred2 <- predict(gamage2, newdata=data.frame("age"=ageindex), type="response")

Now for the unpenalized GAM the new probabilities, the new B–Splines and again the means are plotted. The fitted line for the probabilities is very wiggly now.

par(cex=1.3, lwd=1.5)
plot(ageindex, pred2, type="l", ylim=c(0,0.8), col="gray", xlab="age/years",
    ylab="short-term unemployment")
for(i in 1:15)
    lines(ageindex, (0.1*gamage2$coefficients[i+1]+0.3)*
        bspline(x=ageindex,k=k,i=i+1,m=2),type="l", col="gray")
points(minage:maxage, meanage[minage:maxage], pch=20)