

Investigating the proportional odds transformation of risks and its effect on mROC

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```
library(mROC)
library(pROC)

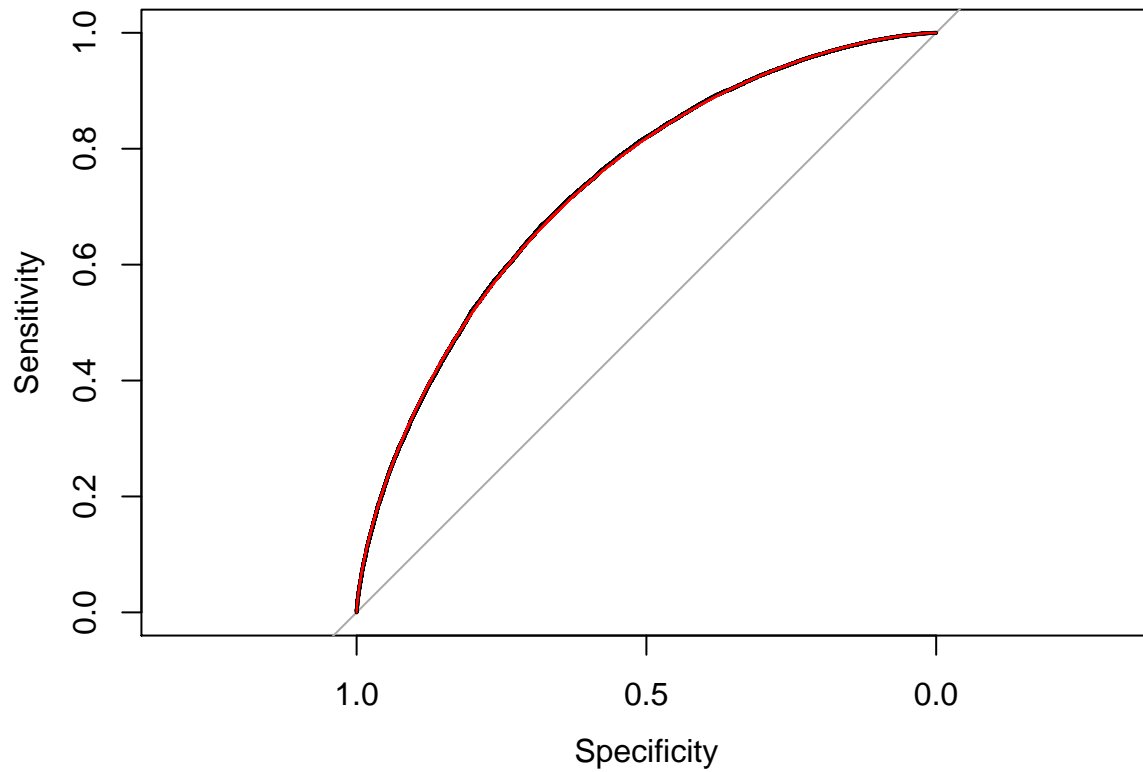
## Warning: package 'pROC' was built under R version 3.5.3
## Type 'citation("pROC")' for a citation.
##
## Attaching package: 'pROC'
## The following objects are masked from 'package:stats':
##
##      cov, smooth, var
n<-100000
```

Correct model

```
p<-rbeta(n,2,3)
y<-rbinom(n,1,p)

plot(roc(y,p))

## Setting levels: control = 0, case = 1
## Setting direction: controls < cases
lines(mROC(p),col="red")
```



Now lets transform the risks

```
p<-rbeta(n,2,3)
y<-rbinom(n,1,p)
```

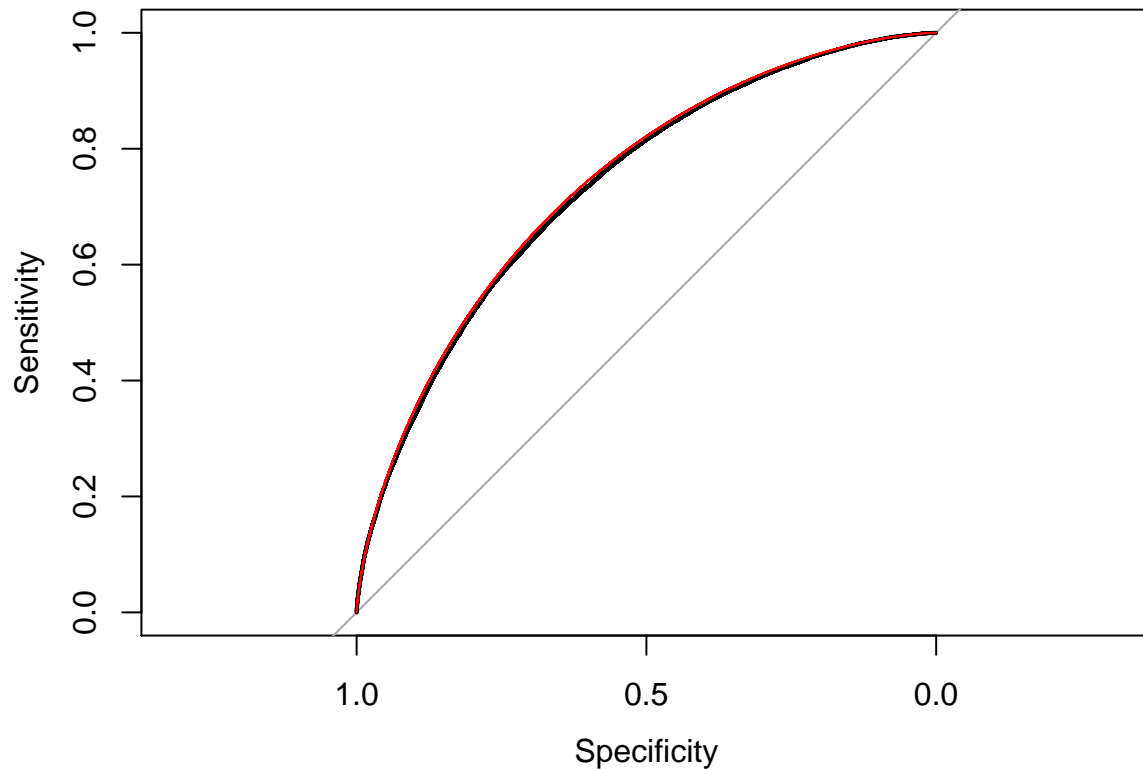
```
odds<-p/(1-p)
odds<-odds*3
p<-odds/(1+odds)
```

```
plot(roc(y,p))
```

```
## Setting levels: control = 0, case = 1
```

```
## Setting direction: controls < cases
```

```
lines(mROC(p),col="red")
```



But mROC is not transformation-invariant. Consider this one, based on ‘shrunk’ beta distribution for risks (I agree it is a bit extreme):

```
p<-rbeta(n,0.5,0.5)/10
y<-rbinom(n,1,p)
```

```
odds<-p/(1-p)
odds<-odds*10
p<-odds/(1+odds)
```

```
plot(roc(y,p))
```

```
## Setting levels: control = 0, case = 1
```

```
## Setting direction: controls < cases
```

```
lines(mROC(p),col="red")
```

