# Paired Comparison Preference Models

## Practicals and Home work

Regina Dittrich & Reinhold Hatzinger

Department of Statistics and Mathematics, WU Vienna

---

**Questions 1:** analyse the data

```
> library(prefmod)
> load("teacher7.Rdata")
> names(teacher7)
 [1] "V1"  "V2"  "V3"  "V4"  "V5"  "V6"  "V7"  "V8"  "V9"  "V10" "V11"
[12] "V12" "V13" "V14" "V15" "V16" "V17" "V18" "V19" "V20" "V21" "SEX"
[23] "SCH" "LEI"
> items <- c("st", "kf", "ak", "iu", "ad", "sk", "va")
> t0 <- llbtPC.fit(teacher7, 7, obj.names = items)
> t0
Call:

gnm(formula = formula, eliminate = elim, family = poisson, data = dfr)

Coefficients of interest:
     st       kf       ak       iu       ad       sk       va
 0.2085  -0.0802   0.0882  -0.1526  -0.1405   0.1215       NA

Deviance:              480.38
Pearson chi-squared: 460.96
Residual df:              15
```

---

**Questions 2:** Does the model fit?

The deviance is 480.38 with 15.

We get the probabilty for the basic model by
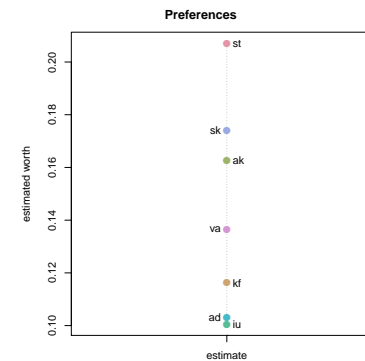
```
> dev1 <- round(t0$deviance, digits = 5)
> df1 <- t0$df.residual
> prob1 <- 1 - pchisq(dev1, df1)
> print(prob1)
[1] 0
```

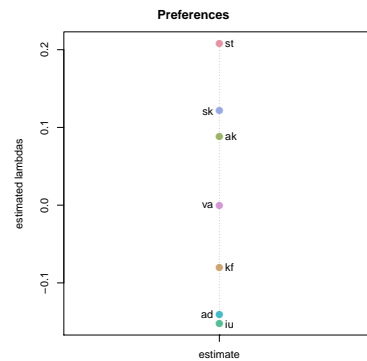Definitely smaller than 0.05, so we have to say that the basic model does not fit

---

**Questions 3a:** Plot the worth for all pupils

```
> w_t0 <- llbt.worth(t0)
> plotworth(w_t0, ylab = "estimated worth")
```

**Questions 3b:** Plot the estimates $\lambda$ for all pupils

```
> l_t0 <- llbt.worth(t0, outmat = "lambda")
> plotworth(l_t0, ylab = "estimated lambdas")
```



Preferences

---

Data preparation:

```
> data <- read.csv2("gutschein.csv", header=T)
> datM <- as.matrix(data)
> #
> # recode columns 1 - 6
> datM<-as.matrix(data[,1:6])
> datM<-ifelse(datM == 2, -1, datM)
> #
> # reverse
> datM[, 3] <- datM[, 3] * -1
> datM[, 6] <- datM[, 6] * -1
> #
> # reorder
> datM2 <- datM[, c(6,5,1,2,4,3)]
> #
> # make data.frame
> dataneu<-data.frame(datM2,data[,7:8])
> names(dataneu) <- names(data[1:8])
```
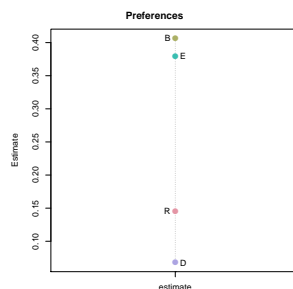
---
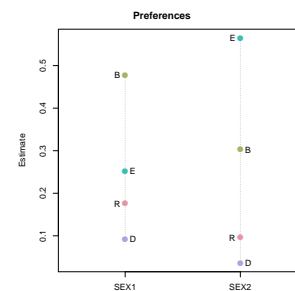
6. Analysieren Sie die Daten (Basis Modell)

```
> onames <- c("R", "B", "E", "D")
> m0 <- llbtPC.fit(dataneu, 4, formel = ~1, elim = ~SEX, obj.names = onames)
> worth0 <- llbt.worth(m0)
> plotworth(worth0)
```



Preferences

---

9. Fit a model including the subject covariate SEX

```
> m1<-llbtPC.fit(dataneu,4,formel=~SEX,obj.names=onames)
> #
> # calculate worth and plot with SEX
> worthS<-llbt.worth(m1)
> plotworth(worthS)
```
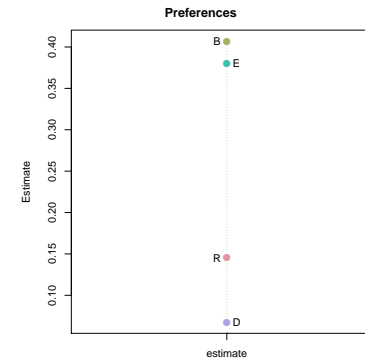


Preferences

```
> anova(m0,m1)
Analysis of Deviance Table

Model 1: y ~ R + B + E + D - 1
Model 2: y ~ R + B + E + D + R:SEX + B:SEX + E:SEX + D:SEX - 1
  Resid. Df Resid. Dev Df Deviance
1         9       10.55
2         6        5.41  3     5.13
> #
> # deviance change significant?
> 1 - pchisq(5.13, 3)
[1] 0.16252
```

## 10. Fit a model including the subject covariate FACH

```
> mP0<-llbtPC.fit(dataneu,4,formel=~1, elim=~FACH,obj.names=onames)
> worthP0<-llbt.worth(mP0)
> plotworth(worthP0)
```

```
> mP1 <- llbtPC.fit(dataneu, 4, formel = ~FACH, elim = ~FACH,
+     obj.names = onames)
> worthP1 <- llbt.worth(mP1)
> plotworth(worthP1)
```