R Notebook

```
suppressMessages(library(AER))
suppressMessages(library(survival))

data(tobin)
data(Affairs)
```

Tobit Modell auf das Affairs-Datenset (nur mit einigen numerischen erkl. Variablen)
Zuerst getrennt nach Männern/Frauen

```
# Erklärende Variablen:
#   age             Alter
#   yearsmarried    Dauer der Ehe in Jahren
#   religiousness   Religiosität (1-5 = gegen-sehr)
#   education       Kodierte Ausbildung (9-20 = grade school-Ph.D.)
#   rating          Selbsteinschätzung der Ehe (1-5 = sehr unglücklich-sehr glücklich)

model.affairs   <- tobit(affairs ~ age + yearsmarried + religiousness + education + rating,
                         data=Affairs, x=TRUE)
model.affairs.m <- tobit(affairs ~ age + yearsmarried + religiousness + education + rating,
                         data=Affairs, subset=gender == "female")
model.affairs.w <- tobit(affairs ~ age + yearsmarried + religiousness + education + rating,
                         data=Affairs, subset=gender == "male")

summary(model.affairs.m)
```

```
##
## Call:
## tobit(formula = affairs ~ age + yearsmarried + religiousness +
##     education + rating, subset = gender == "female", data = Affairs)
##
## Observations:
##          Total  Left-censored     Uncensored Right-censored
##            315            243             72              0
##
## Coefficients:
##               Estimate Std. Error z value Pr(>|z|)
## (Intercept)    7.33598    6.12094   1.199  0.23072
## age           -0.18979    0.13812  -1.374  0.16943
## yearsmarried   0.58465    0.22325   2.619  0.00882 **
## religiousness -1.70973    0.62548  -2.733  0.00627 **
## education      0.10840    0.34778   0.312  0.75528
## rating        -2.44248    0.62281  -3.922 8.79e-05 ***
## Log(scale)     2.18521    0.09783  22.338  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Scale: 8.892
##
## Gaussian distribution
## Number of Newton-Raphson Iterations: 4
## Log-likelihood:  -349 on 7 Df
```

```
## Wald-statistic: 32.88 on 5 Df, p-value: 3.9675e-06
```

```
summary(model.affairs.w)
```

```
##
## Call:
## tobit(formula = affairs ~ age + yearsmarried + religiousness +
##     education + rating, subset = gender == "male", data = Affairs)
##
## Observations:
##          Total  Left-censored     Uncensored Right-censored
##            286            208             78              0
##
## Coefficients:
##               Estimate Std. Error z value Pr(>|z|)
## (Intercept)    9.14550    5.36411   1.705  0.08820 .
## age           -0.19038    0.09793  -1.944  0.05190 .
## yearsmarried   0.56435    0.17422   3.239  0.00120 **
## religiousness -1.67423    0.52965  -3.161  0.00157 **
## education      0.08739    0.25126   0.348  0.72798
## rating        -2.19472    0.56111  -3.911 9.18e-05 ***
## Log(scale)     2.03803    0.09231  22.078  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Scale: 7.675
##
## Gaussian distribution
## Number of Newton-Raphson Iterations: 4
## Log-likelihood: -355.5 on 7 Df
## Wald-statistic:  34.5 on 5 Df, p-value: 1.8961e-06
```

Average Marginal effects:
Wir wissen für die ME: $\alpha := \beta/\sigma$ und $\frac{\partial E(y_i)}{\partial x_i} = \Phi(x_i'\alpha)\beta = \Phi(x_i'\beta/\sigma)\beta$
Also: $AME_j = \Phi(\overline{x_i'\alpha})\beta_j$, wobei $\bar{z}$ den arithm. Mittelwert bezeichnet

```
# MARGIN = 2 ... Funktion auf Spalten anwewden
# FUN = mean ... Funktion ist mean()
pnorm(
  apply(
    model.affairs$x %*% model.affairs$coef / model.affairs$scale,
    MARGIN = 2, FUN = mean
  )
) * model.affairs$coef[-1]
```

```
##           age  yearsmarried religiousness     education        rating
##   -0.04046571    0.12786464   -0.39566086    0.04277384   -0.54411646
```

Nur der Vollständigkeit halber:
Das "tobin" dataset
Anzahl an gekauften "durable goods" abhängig von Alter und Einkommen (in 1000$)

```
model.tobin <- tobit(durable ~ age + quant, data=tobin)
summary(model.tobin)
```

```
##
## Call:
```

```
## tobit(formula = durable ~ age + quant, data = tobin)
##
## Observations:
##          Total  Left-censored     Uncensored Right-censored
##             20             13              7              0
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept) 15.14487   16.07945   0.942    0.346
## age         -0.12906    0.21858  -0.590    0.555
## quant       -0.04554    0.05825  -0.782    0.434
## Log(scale)   1.71785    0.31032   5.536  3.1e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Scale: 5.573
##
## Gaussian distribution
## Number of Newton-Raphson Iterations: 3
## Log-likelihood: -28.94 on 4 Df
## Wald-statistic: 1.124 on 2 Df, p-value: 0.57002
```