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# Exercises Quantitative Methods

Worksheet: Additional Regression Methods

**Exercise 7.1** (Binary Logistic Regression)
In a poll in the chocolate museum in Cologne we want to identify the determining factors for recommendation of the museum. In the file *schoki.sav* we consider the following variables:

$Y=$ Recommendation (1=yes, 0=no)

$X_1=$ Visiting Day (1= Tuesday, 2=Wednesday, ... 6=Sunday)

$X_2=$ Consumption of chocolate (1=yes, 0=no)

$X_3=$ Taste of chocolate; i.e. "Do you like the chocolate of the museum?" (0=never tasted, 1=yes, 2=no)

$X_4=$ Gender (1=male, 2=female)

$X_5=$ Age

$X_6=$ Time of visit (1=10 to 12 o'clock, 2=12 to 2 p.m., 3=2 to 4 p.m., 4=4 p.m. till closing time)

Consider the model $Y \approx b_0 + b_1 \cdot x_1 + b_2 \cdot x_2 + b_3 \cdot x_3 + b_4 \cdot x_4 + b_5 \cdot x_5 + b_6 \cdot x_6$ of a binary logsitic regression and identify the variables that influence the recommendation of the museum.

Hint for SPSS: Nominal levelled variables must be denoted as "categorial" variables.

**Exercise 7.2** (Multinomial Logistic Regression)
Please open the file *customer_dbase.sav*. Consider the nominal leveled variable $Y =$ Reason = "Primary reason for being a customer here" (variable number 61) with the categories:

1. Prices
2. Convenience
3. Service
4. Other

Do you find some independent variables that influence the value of $Y$?

**Exercise 7.3** (Ordinal Regression)
In the file *1991 US.sav* of a poll we want to detect the variables that influence the general happiness. We consider the following variables:

$Y=$ General Happiness (1=very satisfied, 2=pretty satisfied, 3=not very satisfied)

$X_1=$ Ethnic group (1=white, 2=black, 3=others)

$X_2=$ Years of the education = ausbild
1. class: up to 10 years
2. class: 11 up to 12 years
3: class: 13 up to 15 years
4. class: more than 15 years

$X_3=$ Number of children
1. class: no kids
2. class: one child
3. class: two children
4. class: three or more children

$X_4=$ job1 = no employment and searching for a job since more than one month (1=yes, 2=no)

Consider the model $Y \approx b_0 + b_1 \cdot x_1 + b_2 \cdot x_2 + b_3 \cdot x_3 + b_4 \cdot x_4$ of an ordinal regression and identify the variables that influence the degree of happiness.

*Solution of exercise 7.2:*
$Y$ = Primary reason for being a customer (1=Prices, 2=Convenience, 3=Service, 4=Other)
$X_1$ = Job category
$X_2$ = Job Satisfaction
$X_3$ = Level of education
$X_4$ = Secondary credit card
$X_5$ = Spouse level of education
$X_6$ = Years held primary credit card (category)

Model: $Y \approx b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6$

Goodness of Fit test Pearson $p$-value=0.546
Goodness of Fit test Deviance $p$-value=1.0

Nagelkerke Pseudo R-Square =0.214

Likelihood Ratio test ($p$-value):
Level of education 0.018
Job category 0.017
Job satisfaction 0.002
Secondary credit card 0.246
Spouse level of education 0.212