

SAMPLING, WEIGHTING AND ESTIMATION

EXERCISE 3

Stefan Zins, Matthias Sand
and Jan-Philipp Kolb

GESIS - Leibniz Institute
for the Social Sciences

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- 1 Download the data set for Germany of the 5th ESS-Round (Country File and Sampling Data)
<http://www.europeansocialsurvey.org/data/country.html?c=germany>
- 2 Estimate the design effect using the variables **dweight**, **PSU** and **agea** (model based approach)
Advice: The variable **PSU** has to be a factor
- 3 Calculate the effective sample size

MODEL BASED APPROACH

$$\hat{deff} = \hat{deff}_p * \hat{deff}_c = n \frac{\sum_{h=1}^l d_h^2 n_h}{(\sum_{h=1}^l d_h n_h)^2} * (1 + (b^* - 1)\rho)$$

$$\hat{\rho}^{AOV} = \frac{MSB - MSW}{MSB + (K - 1)MSW}$$

$$MSB = \frac{SSB}{l - 1}; \quad MSW = \frac{SSW}{n - l}; \quad K = \frac{1}{l - 1} \left(n - \sum_{h=1}^l \frac{n_h^2}{n} \right);$$

$$b^* = \frac{\sum_{l=1}^L (\sum_{i=1}^{n_h} w_{li})^2}{\sum_{l=1}^L \sum_{i=1}^{n_h} w_{li}^2}$$

n_h is the number of units per cluster; b^* is the average cluster size; ρ reflects the Intraclass Correlation Coefficient (ICC)

⇒ $deff_p$ captures the design effect due to unequal inclusion probabilities

Obtaining *MSB*, *MSW* and *b**:

```
Ger.d <- read.spss("ESS5DE.spss/ESS5DE.sav",  
                  to.data.frame = TRUE,  
                  use.value.labels = TRUE)  
Ger.ctry <- read.spss("ESS5_DE_SDDF.spss/ESS5_DE_SDDF.por",  
                     to.data.frame = TRUE,  
                     use.value.labels = TRUE)  
  
colnames(Ger.d)[5] <- "IDNO"  
Ger <- merge(Ger.d, Ger.ctry, by="IDNO", all.x = TRUE)  
Ger$PSU <- as.factor(Ger$PSU)  
n <- nrow(Ger)  
L <- length(unique(Ger$PSU))
```

Obtaining *MSB*, *MSW* and b^* :

```
## deffc
b <- sum(tapply(Ger$dweight, Ger$PSU,
               function(x) sum(x^2)))/sum(Ger$dweight^2)
# Calculate an anova for the regression model Age by PSU
# (Coule also be any other Variable)
SS <- anova(lm(as.numeric(Ger$agea)~Ger$PSU))
# MSB and MSW are the means of SSB and SSW
MSB <- SS$`Mean Sq`[1]
MSW <- SS$`Mean Sq`[2]
```