Structural Equation Models 2019

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Week 1

Exercise 1.2

a) LINEAR REGRESSION

In this exercise a linear regression model was built for one continuous observed dependent variable (y1) with two covariates (x1 and x3). The data "ex3.1" was first manually imported into R and saved as .Rdata -file with R code lines:

df <- ex3.1

save(df, file="df.Rdata")

Here is a summary of the variables:

```
load("df.Rdata")
summary(df)
```

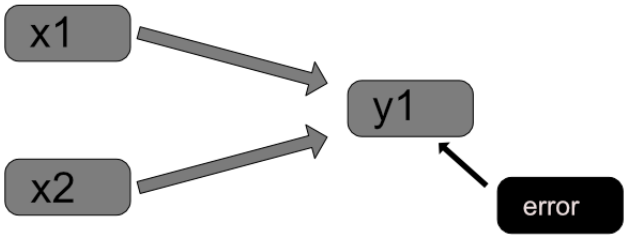
```
##        V1                 V2                  V3          
##  Min.   :-4.1163   Min.   :-3.145148   Min.   :-3.13875  
##  1st Qu.:-0.5269   1st Qu.:-0.749801   1st Qu.:-0.75466  
##  Median : 0.4288   Median : 0.023194   Median :-0.04029  
##  Mean   : 0.4848   Mean   : 0.001289   Mean   :-0.04216  
##  3rd Qu.: 1.5721   3rd Qu.: 0.755620   3rd Qu.: 0.71940  
##  Max.   : 5.1110   Max.   : 2.920440   Max.   : 2.87514
```

Then a model was built according to instructions (y1 is the dependent variable, x1 and x3 are independent explanatory variables):

```
y1 <- df$V1
x1 <- df$V2
x3 <- df$V3

model <- lm(y1 ~ x1 + x3)
summary(model)
```

```
##
## Call:
## lm(formula = y1 ~ x1 + x3)
##
## Residuals:
##     Min      1Q  Median      3Q     Max 
## -3.1506 -0.5752  0.0235  0.5663  3.1899 
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)    
## (Intercept)  0.51096    0.04356   11.73   <2e-16 ***
## x1           0.96949    0.04163   23.29   <2e-16 ***
## x3           0.64904    0.04451   14.58   <2e-16 ***
```




```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.9731 on 497 degrees of freedom
## Multiple R-squared:  0.609,  Adjusted R-squared:  0.6075
## F-statistic: 387.1 on 2 and 497 DF,  p-value: < 2.2e-16
```

According to the results both covariates x1 and x3 are statistically significant ($p < 0.001$). They both have a positive effect on the variable y1: when x1 increases one unit, the variable y1 increases 0.97 units (when x3 is considered a constant) and when x3 increases one unit, the variable y1 increases 0.65 units (when x1 is considered a constant). The model explains around 60% of the variance in the variable y1 (Adjusted R-squared = 0.6075).

Here is a graph of the model (drawn with Affinity Designer):

b) EXPLORATORY FACTOR ANALYSIS
