Duration of Unemployment - Different Codings of Covariables

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The unemployment data represent a contingency table with rows refering to gender and columns to duration of unemployment.

```
> unemployment <- matrix(c(403, 238, 167, 175), nrow=2, ncol=2)
> rownames(unemployment) <- c("male","female")
> colnames(unemployment) <- c("<6 month",">6 month")
> unemployment
```

```
       <6 month >6 month
male        403      167
female      238      175
```

```
> rowSums(unemployment)
```

```
  male female
   570    413
```

Calculation of odds and log-odds.

```
> ( odds_m <- 403/167 )
```

```
[1] 2.413174
```

```
> ( odds_w <- 238/175 )
```

```
[1] 1.36
```

```
> ( log_odds_m <- log(403/167) )
```

```
[1] 0.8809427
```

```
> ( log_odds_w <- log(238/175) )
```

```
[1] 0.3074847
```

For the fitting of a logit-model an alternative dataset is generated. First (0-1)-coding is considered

```
> gender <- c(rep(1, 403+167), rep(0,238+175))
> unemp <- c(rep(1, 403), rep(0, 167), rep(1, 238), rep(0, 175))
```

For control, one can compute the crosstabulation of the generated data.

```
> table(gender, unemp)

      unemp
gender   0   1
     0 175 238
     1 167 403
```

Fit of a logit model.

```
> bin <- glm(unemp ~ gender, family=binomial)
> summary(bin)

Call:
glm(formula = unemp ~ gender, family = binomial)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-1.5669  -1.3105   0.8327   0.8327   1.0499

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.30748    0.09958   3.088  0.00202 **
gender       0.57346    0.13559   4.229 2.34e-05 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 1270.3  on 982  degrees of freedom
Residual deviance: 1252.4  on 981  degrees of freedom
AIC: 1256.4

Number of Fisher Scoring iterations: 4

> bin$coef

(Intercept)      gender
  0.3074847   0.5734580

> exp(bin$coef)

(Intercept)      gender
   1.360000    1.774392
```

Now a dataset in effect-coding is created.

```
> gender_effect <- c(rep(1, 403+167), rep(-1,238+175))
```

For control, one can compute the crosstabulation of the generated data.

```
> table(gender_effect, unemp)
```

```
             unemp
gender_effect   0   1
           -1 175 238
           1  167 403
```

Fit a logit model.

```
> bin_effect <- glm(unemp ~ gender_effect, family=binomial)
> summary(bin_effect)

Call:
glm(formula = unemp ~ gender_effect, family = binomial)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-1.5669  -1.3105   0.8327   0.8327   1.0499

Coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)     0.5942     0.0678   8.765  < 2e-16 ***
gender_effect   0.2867     0.0678   4.229 2.34e-05 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 1270.3  on 982  degrees of freedom
Residual deviance: 1252.4  on 981  degrees of freedom
AIC: 1256.4

Number of Fisher Scoring iterations: 4

> bin_effect$coef

  (Intercept) gender_effect
    0.5942137     0.2867290

> exp(bin_effect$coef)

  (Intercept) gender_effect
     1.811606      1.332063
```

Now we consider education level as explanatory variable.

```
> unemp_level <- matrix(c(202, 307, 87, 45,
+                          96, 162, 66, 18), nrow=4, ncol=2)
> colnames(unemp_level) <- c("Short term","Long term")
> unemp_level

     Short term Long term
[1,]        202        96
[2,]        307       162
[3,]         87        66
[4,]         45        18
```

```
> rowSums(unemp_level)

[1] 298 469 153  63
```

For the fitting of a logit-model a new dataset is generated. First (0-1)-coding is considered.

```
> level <- factor(c(rep(1, 202+96), rep(2,307+162), rep(3,87+66), rep(4,45+18)))
> unemp_l <-  c(rep(1, 202), rep(0, 96), rep(1, 307), rep(0, 162),
+              rep(1, 87), rep(0, 66), rep(1, 45), rep(0, 18))
```

For control, one can compute the crosstabulation of the generated data.

```
> table(level, unemp_l)

     unemp_l
level   0   1
    1  96 202
    2 162 307
    3  66  87
    4  18  45
```

Fit a logit model on the data. Define the variable level as a factor with the reference category 4.

```
> level <- relevel(level, ref=4)
> bin_l <- glm(unemp_l ~ level, family=binomial)
> summary(bin_l)

Call:
glm(formula = unemp_l ~ level, family = binomial)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-1.5829  -1.4581   0.8819   0.9206   1.0626

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)   0.9163     0.2789   3.286  0.00102 **
level1       -0.1724     0.3052  -0.565  0.57222
level2       -0.2770     0.2953  -0.938  0.34818
level3       -0.6400     0.3231  -1.981  0.04763 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 1270.3  on 982  degrees of freedom
Residual deviance: 1263.8  on 979  degrees of freedom
AIC: 1271.8

Number of Fisher Scoring iterations: 4
```

Now additionally quasi–variances can be computed. Therefore the function "qvcalc" from the "qvcalc"–library is used.

```
> library(qvcalc)
> qv<-qvcalc(bin_l,"level")
> summary(qv)

Model call:  glm(formula = unemp_l ~ level, family = binomial)
Factor name:  level
        estimate        SE    quasiSE    quasiVar
    4  0.0000000 0.0000000 0.27888650 0.077777678
    1 -0.1723712 0.3051964 0.12396432 0.015367154
    2 -0.2770393 0.2953097 0.09710904 0.009430166
    3 -0.6400374 0.3231462 0.16323531 0.026645768
Worst relative errors in SEs of simple contrasts (%):  0 0
Worst relative errors over *all* contrasts (%):  0 0

> plot(qv)
```