$$\hat{y} = 3 + 4{,}7\,x_1 + 0{,}9\,x_2 + 4{,}6\,x_3 + 10{,}8\,x_4$$

$se(\hat{\beta_0}) = 1{,}7$

$se(\hat{\beta_1}) = 3{,}1$

$se(\hat{\beta_2}) = 0{,}4$

$se(\hat{\beta_3}) = 2{,}1$

$se(\hat{\beta_4}) = 3$

90 % доверительный интервал

Значимы ли параметры

$$t = \frac{\hat{\beta_0} - \beta_0}{se(\hat{\beta_0})} \sim t_{n-k} = t_{41}$$

$t_{41} = 1{,}68$

$$\beta_0 \in \left(\hat{\beta_0} - t_{кр}\,se(\hat{\beta_0}) \;;\; \hat{\beta_0} + t_{кр} \cdot se(\hat{\beta_0}) \right)$$

β_0:

$0 \notin (0{,}144 \;;\; 5{,}856) \Rightarrow \beta_0$ значим

β_1:

$0 \in (-0{,}508 \;;\; 9{,}908) \Rightarrow \beta_1$ незначим

β_2:

$0 \notin (0{,}228 \;;\; 1{,}572) \Rightarrow \beta_2$ значим

β_3:

$0 \notin (5{,}76 \;;\; 15{,}84) \Rightarrow \beta_3$ значим

$$X_4(y) = \begin{pmatrix} 1 \\ 0 \\ 4 \\ 3 \\ 0 \end{pmatrix} \qquad x = \begin{pmatrix} x_0 & x_1 & x_2 & x_3 & x_5 \\ 1 & 0 & 4 & 0 & 1 \\ 1 & 0 & 1 & 1 & 1 \\ 1 & 3 & 2 & 0 & 0 \\ 1 & 1 & 3 & 0 & 0 \\ 1 & 0 & 5 & 0 & 0 \end{pmatrix}$$

$$\hat{\beta} = \left(x^T \cdot x\right)^{-1} \cdot x^T y$$

$$x^T = \begin{pmatrix} 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 3 & 1 & 0 \\ 4 & 1 & 2 & 3 & 5 \\ 0 & 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 \end{pmatrix}$$

$$x^T \cdot x = \begin{pmatrix} 5 & 4 & 15 & 1 & 2 \\ 4 & 10 & 9 & 0 & 0 \\ 15 & 9 & 55 & 1 & 5 \\ 1 & 0 & 1 & 1 & 1 \\ 2 & 0 & 5 & 1 & 2 \end{pmatrix} = A$$

$$A^{-1} = \frac{1}{|A|} \cdot A_q^T$$

$$|A| = 9$$

$$\left(\begin{array}{ccccc|ccccc} 5 & 4 & 15 & 1 & 2 & 1 & 0 & 0 & 0 & 0 \\ 4 & 10 & 9 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 15 & 9 & 55 & 1 & 5 & 0 & 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 1 & 1 & 0 & 0 & 0 & 1 & 0 \\ 2 & 0 & 5 & 1 & 2 & 0 & 0 & 0 & 0 & 1 \end{array}\right)$$

$$\left(\begin{array}{ccccc} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{array}\right| \left.\begin{array}{ccccc} 33\frac{2}{9} & -6\frac{8}{9} & -7\frac{1}{9} & -21\frac{1}{3} & -4\frac{7}{9} \\ -6\frac{8}{9} & 1\frac{5}{9} & 1\frac{4}{9} & 4\frac{1}{3} & 1\frac{1}{9} \\ -7\frac{1}{9} & 1\frac{4}{9} & 1\frac{5}{9} & 4\frac{2}{3} & \frac{8}{9} \\ -21\frac{1}{3} & 4\frac{1}{3} & 4\frac{2}{3} & 16 & 1\frac{2}{3} \\ -4\frac{7}{9} & 1\frac{1}{9} & \frac{8}{9} & 1\frac{2}{3} & 2\frac{2}{3} \end{array}\right)$$

$$X^T \cdot y = \left(\begin{array}{ccccc} 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 3 & 1 & 0 \\ 4 & 1 & 2 & 3 & 5 \\ 0 & 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 \end{array}\right)\left(\begin{array}{c} 1 \\ 0 \\ 4 \\ 3 \\ 0 \end{array}\right) = \left(\begin{array}{c} 8 \\ 15 \\ 21 \\ 0 \\ 1 \end{array}\right)$$

$$A^{-1} \cdot (X^T \cdot y) = \left(\begin{array}{c} \frac{25}{3} \\ -\frac{1}{3} \\ -\frac{5}{3} \\ -6 \\ -\frac{2}{3} \end{array}\right) \Rightarrow \beta$$

$$y = \frac{25}{3} - \frac{1}{3}X_1 - \frac{5}{3}X_2 - 6X_3 - \frac{2}{3}X_4 + \varepsilon$$

$$\hat{y} = \left(\begin{array}{c} 1 \\ 0 \\ 4 \\ 3 \\ 0 \end{array}\right) \Rightarrow \text{ungen. } VIF_4 \Rightarrow \infty$$

-7, 10, -8, -1000, 15, 0, -40, 19, 30, 16, 17, 32, 200, 1

Ранжируем данные:

-1000	1
-40	2
-8	3
-7	4
0	5
1	6
10	7
15	8
16	9
17	10
19	11
30	12
32	13
200	14

$NQ_1 = \dfrac{14+1}{4} = 3,75$

$NQ_2 = \dfrac{2(14+1)}{4} = 7,5$

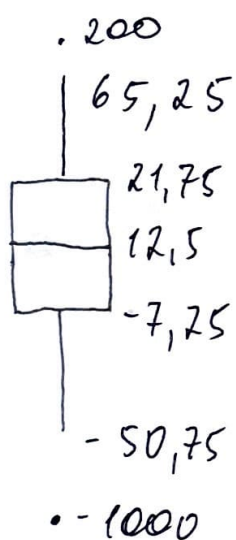$NQ_3 = \dfrac{3(14+1)}{4} = 11,25$

$Q_1 = -8 + 0,75(-7+3) = -7,25$

$Q_2 = 10 + 0,5(15-10) = 12,5$

$Q_3 = 19 + 0,25(30-19) = 21,75$

$IQR = Q_3 - Q_1 = 21,75 + 7,25 = 29$

$Q_1 - 1,5 IQR = -50,75$

$Q_3 + 1,5 IQR = 65,25$

. 200

| 65,25
| 21,75
| 12,5
| -7,25

- 50,75

.- 1000

200 - выброс

-1000 - выброс