Anhang B

<u>Koeffizientengleichungen</u>

Generell gilt als verkürzte und somit vereinfachte Schreibweise

$\sum y_i = [y]$ $\quad \sum {x_i}^2 = [x^2]$ $\quad (\sum x_i)^2 = [x^2]^2$

$\sum (y_i * x_i) = [y * x]$ $\quad \sum (y_i * {x_i}^2) = [y * x^2]$ $\quad \frac{1}{n} \sum x_i = \bar{x} = \frac{1}{n} [x]$

1. Für die lineare Regressionsfunktion: $\breve{y} = a_0 + a_1 x_i$

Koeffizienten der linearen Regressionsfunktion

$$a_1 = \frac{\overline{xy} - \overline{x}\,\overline{y}}{\overline{x^2} - \overline{x}^2}$$

$$a_0 = \overline{y} - a_1 \overline{x}$$

2. Für die quadratische Regression: $\breve{y} = a_0 + a_1 x_i + a_2 {x_i}^2$

Koeffizienten der quadratischen Regressionsfunktion

$$a_2 = \frac{\frac{1}{n}[yx^2]\,[x^2] - [yx^2]\,\overline{x}^2 - \frac{1}{n}\overline{y}\,[x^2]^2 - \frac{1}{n}[yx]\,[x^2] + \frac{1}{n}[yx]\,\overline{x}\,[x^2] + \overline{x}\,\overline{y}\,[x^3]}{\frac{2}{n}\overline{x}\,[x^2]\,[x^3] - \frac{1}{n}[x^3]^2 - \frac{1}{n^2}[x^2]^3 + \frac{1}{n}[x^2]\,[x^4] - \overline{x}^2\,\frac{2}{n}\overline{x}\,[x^4]}$$

$$a_1 = \frac{\overline{xy} - \overline{x}\,\overline{y} + a_2\,\overline{x}\,\overline{x^2} - a_2\,\overline{x^3}}{\overline{x^2} - \overline{x}^2}$$

$$a_0 = \overline{y} - a_1\overline{x} - a_2\,\overline{x^2}$$

3. Für die kubische Regressionsfunktion: $\breve{y} = a_0 + a_1 x_i + a_2 {x_i}^2 + a_3 {x_i}^3$

<u>Koeffizient</u> $\boldsymbol{a_3}$

$a_3 = \frac{e*f-h*i}{h*j-e*g}$ mit

$$e = \frac{1}{([x^2]*[x]*([x^4]*n-[x]*[x^3]))-(n*[x^3]*([x^4]*n-[x]*[x^3]))+([x^5]*n*(n*[x^2]-[x]^2))-([x^3]*[x^2]*(n*[x^2]-[x]^2))}$$

$$f = \Big(\big([y*x^3]*n*(n*[x^2]-[x]^2)\big)-\big([x^3]*[y]*(n*[x^2]-[x]^2)\big) \\ -\big(n*[y*x]*([x^4]*n-[x]*[x^3])\big)+\big([y]*[x]*([x^4]*n-[x]*[x^3])\big)\Big)$$

$$g = \Big((n*[x^2]-[x]^2)*\big(([x^3]^2)-([x^6]*n)\big)\Big)+\Big(([x^4]*n-[x]*[x^3])*\big((n*[x^4])- \\ ([x^3]*[x])\big)\Big)$$

$$h = \frac{1}{\Big(\big([x^2]*[x]*(n*[x^3]-[x]*[x^2])\big)-\big(n*[x^3]*(n*[x^3]-[x]*[x^2])\big)+\big([x^4]*n*(n*[x^2]-[x]^2)\big)-\big([x^2]^2*(n*[x^2]-[x]^2)\big)\Big)}$$

$$i = \Big(\big([y*x^2]*n*(n*[x^2]-[x]^2)\big)-\big([x^2]*[y]*(n*[x^2]-[x]^2)\big) \\ -\big(n*[y*x]*(n*[x^3]-[x]*[x^2])\big)+\big([y]*[x]*(n*[x^3]-[x]*[x^2])\big)\Big)$$

$$j = \Bigg(\Big((n*[x^2]-[x]^2)*\big(([x^2]*[x^3])-(n*[x^5])\big)\Big) \\ +\Big((n*[x^3]-[x]*[x^2])*\big((n*[x^4])-([x^3]*[x])\big)\Big)\Bigg)$$

<u>Koeffizient</u> $\boldsymbol{a_2}$

$$a_2 = h*\Bigg(a_3*\bigg(\Big((n*[x^2]-[x]^2)*\big(([x^2]*[x^3])-(n*[x^5])\big)\Big) \\ +\Big((n*[x^3]-[x]*[x^2])*\big((n*[x^4])-([x^3]*[x])\big)\Big)\bigg)+i\Bigg)$$

<u>Koeffizient</u> $\boldsymbol{a_1}$

$$a_1 = a_3*\left(\frac{[x^3]*[x]}{(n*[x^2]-[x]^2)}-\frac{n*[x^4]}{(n*[x^2]-[x]^2)}\right)+a_2*\left(\frac{[x^2]*[x]}{(n*[x^2]-[x]^2)}-\frac{n*[x^3]}{(n*[x^2]-[x]^2)}\right) \\ +\frac{n*[y*x]}{(n*[x^2]-[x]^2)}-\frac{[y]*[x]}{(n*[x^2]-[x]^2)}$$

<u>Koeffizient</u> $\boldsymbol{a_0}$

$$a_o = \frac{1}{n}*[y]-\frac{a_1}{n}*[x]-\frac{a_2}{n}*[x^2]-\frac{a_3}{n}*[x^3]$$