Fordeling af estimationer

$\hat{\beta}$: $\hat{\beta}_1 \sim N(?, ?)$

$$E[\hat{\beta}_1] = \frac{\sum (x_i - \bar{x})(\beta_0 + \beta_1 x_i}{\sum (x_i - \bar{x})^2}$$

$$= \beta_0 \Sigma$$

$$V[\hat{\beta}_1] = \frac{\sum (x_i - \bar{x}) V[Y_i]}{(\sum (x_i - \bar{x})^2)^2}$$

$$= \frac{\sigma^2}{\sum_{i=1}^{n} (x_i - \bar{x})^2}$$

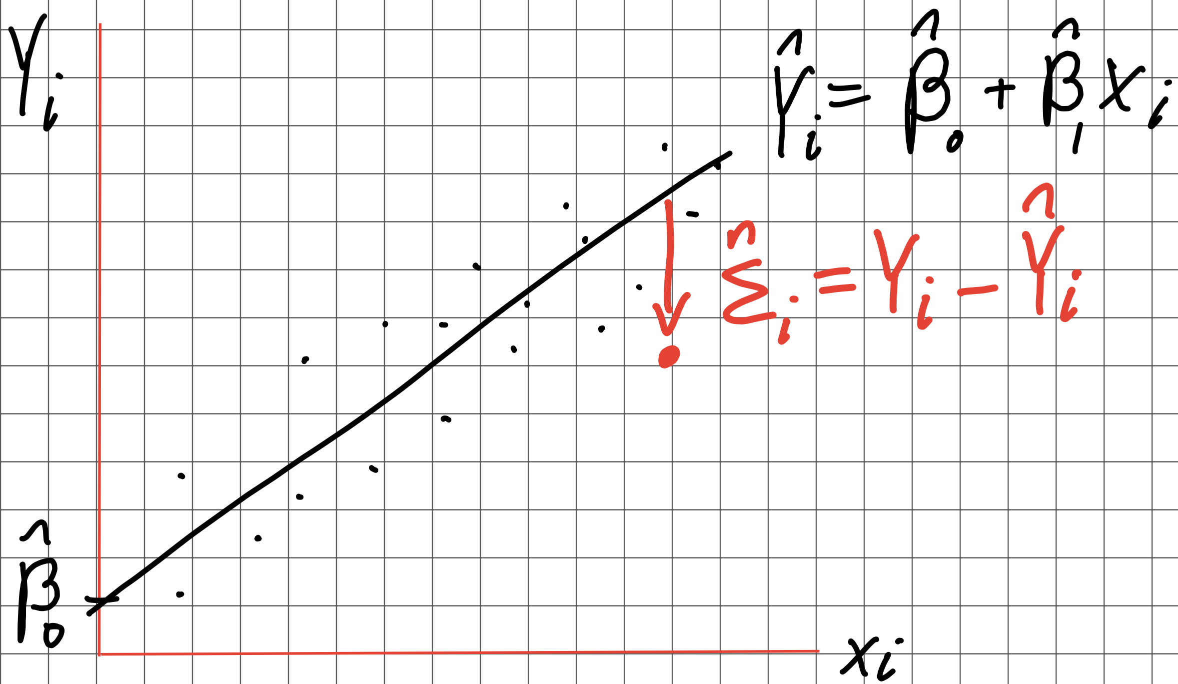
$$= \frac{\sigma^2}{S_{yx}}$$

$$\hat{\beta}_1 \sim N\left(\beta_1, \frac{\sigma^2}{S_{yx}}\right)$$

Så vi vil gerne have så lille varians som mulig

$$\hat{\beta}_0 \sim N\left(\beta_0, \sigma^2\left(\frac{1}{n} + \frac{\sigma^2}{S_{yx}}\right)\right)$$

$$\hat{\sigma}^2 \sim \frac{\sigma^2}{n-2} \chi^2_{n-2}$$



Simple Linear regresion

test statistic

$$T_1 = \frac{\hat{\beta}_1 - \beta_1}{\sqrt{\frac{\hat{\sigma}^2}{S_{xx}}}} \sim t_{n-2}$$

$$H_0 : \beta_1 = \beta_1^*$$

$$H_1 : \beta_1 \neq \beta_1^*$$

indsæt data i H_0

$$T_1 = \frac{\hat{\beta}_1 - \beta_1^*}{\sqrt{\frac{\sigma^2}{S_{yx}}}} = t_1$$

$\leftarrow$ tinv$(1-\frac{\alpha}{2}, n-2)$

Forkast $H_0 \rightarrow |t_1| > t_{n-2,\frac{\alpha}{2}}$

$$P\left(-t_{n-2,\frac{\alpha}{2}} < \frac{\hat{\beta}_1 - \beta_1}{\sqrt{\frac{\hat{\sigma}^2}{S_{xx}}}} < t_{n-2,\frac{\alpha}{2}}\right) 1-\alpha$$

$100(1-\alpha)\%$ CI for β_1

$$\left[\hat{\beta}_1 \pm t_{n-2,\frac{\alpha}{2}} \sqrt{\frac{\hat{\sigma}^2}{S_{xx}}}\right]$$