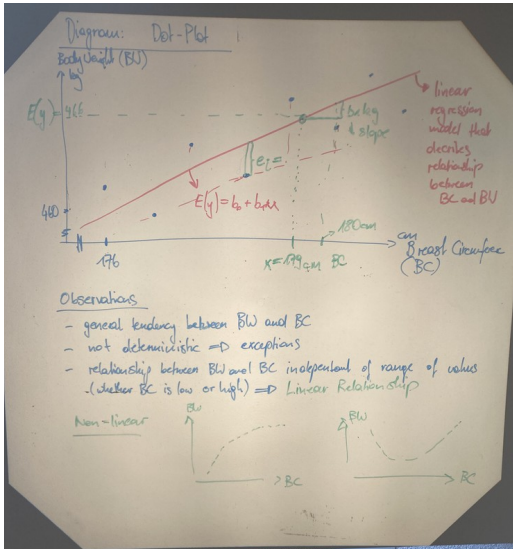


# OHP Picture 1



# OHP Picture 2

## Least Squares

- For a given regression line (red line)
  - compute for each animal the  $e_i$  value
  - square all  $e_i$ -values
  - sum squared  $e_i$

$e_i = y_i - b_0 - b_1 x_i$  for example data set:  $e_1$   
 $e_2$   
 $\vdots$   
 $e_N$

$$\underline{e} = \begin{bmatrix} e_1 \\ e_2 \\ \vdots \\ e_N \end{bmatrix}; \text{ compute: } \underline{e}^T \underline{e} = \sum_{i=1}^N e_i^2 = \sum_{i=1}^N [y_i - \underline{b}_0 - \underline{b}_1 x_i]^2$$

Task: find numeric values for  $b_0$  and  $b_1$  such that  $\underline{e}^T \underline{e}$  is minimal.

- Minimization:
- Compute  $\frac{\partial \underline{e}^T \underline{e}}{\partial b_0}$  ;  $\frac{\partial \underline{e}^T \underline{e}}{\partial b_1}$
  - Find  $\hat{b}_0$  and  $\hat{b}_1$  such that  $\frac{\partial \underline{e}^T \underline{e}}{\partial b_0} = 0$  ;  $\frac{\partial \underline{e}^T \underline{e}}{\partial b_1} = 0$