

### Interaction Model:

□ Model :  $BW \sim BC + \text{Breed}$

$$BW_i = y_i = b_0 + b_1 \cdot BC_i + b_{2i} \cdot BrLi + b_{3i} \cdot BrSi + e_i$$

Annotations:  
-  $b_0$ : Intercept  
-  $b_1$ : slope of regression line  $BW$  on  $BC$   
-  $b_{2i}, b_{3i}$ : Indicators for breed of animal  $i$

if  $i$  is  $\begin{cases} AN \Rightarrow b_{2i} = b_{3i} = 0 \\ LI \Rightarrow b_{2i} = 1 \\ SI \Rightarrow b_{3i} = 1 \end{cases}$

□ Interaction between  $BC$  and  $\text{Breed}$  means that  $b_1$  has linear relationship with  $\text{Breed}$

$$\Rightarrow b_1 = a + b_{4i} \cdot BrLi + b_{5i} \cdot BrSi$$

$$\Rightarrow y_i = b_0 + (a + b_{4i} \cdot BrLi + b_{5i} \cdot BrSi) \cdot BC_i + b_{2i} \cdot BrLi + b_{3i} \cdot BrSi + e_i$$

$$= b_0 + a \cdot BC_i + b_{2i} \cdot BrLi + b_{3i} \cdot BrSi + b_{4i} \cdot BrLi \cdot BC_i + b_{5i} \cdot BrSi \cdot BC_i + e_i$$