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1. Genetic progress
 2. Genetic trend

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$$y_i = b_i + a_i + e_i$$

$$y_i = X_i b_i + Z_i a_i + e_i$$

$$g_{11}$$

$$g_{12}$$

$$g_{22}$$

$$g_{23}$$

$$g_{33}$$

Log L

r_{ij} () ()
 () **DF REML** **AI-REML**

$$y = Xb + Z_1a + e$$

$$y = Xb + Z_1a + Z_2m + e \quad \text{Cov}(a,m)=0$$

$$y = Xb + Z_1a + Z_2m + Z_3c + e \quad \text{Cov}(a,m)=0$$

$$y_i = X_i b_i + Z_i a_i + e_i$$

SPSS

$$t = \frac{b_1 - b_2}{s_b}$$

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \begin{bmatrix} X_1 & 0 & 0 \\ 0 & X_2 & 0 \\ 0 & 0 & X_3 \end{bmatrix} \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix} + \begin{bmatrix} Z_1 & 0 & 0 \\ 0 & Z_2 & 0 \\ 0 & 0 & Z_3 \end{bmatrix} \begin{bmatrix} a_1 \\ a_2 \\ a_3 \end{bmatrix} + \begin{bmatrix} e_1 \\ e_2 \\ e_3 \end{bmatrix}$$

$$\text{Var} \begin{bmatrix} a_1 \\ a_2 \\ a_3 \\ e_1 \\ e_2 \\ e_3 \end{bmatrix} = \begin{bmatrix} g_{11}A & g_{12}A & g_{13}A & 0 & 0 & 0 \\ g_{21}A & g_{22}A & g_{23}A & 0 & 0 & 0 \\ g_{31}A & g_{32}A & g_{33}A & 0 & 0 & 0 \\ 0 & 0 & 0 & r_{11} & r_{12} & r_{13} \\ 0 & 0 & 0 & r_{21} & r_{22} & r_{23} \\ 0 & 0 & 0 & r_{31} & r_{32} & r_{33} \end{bmatrix}$$

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Log L

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Log L

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Log L	Log L	Log L	h ² ±SE
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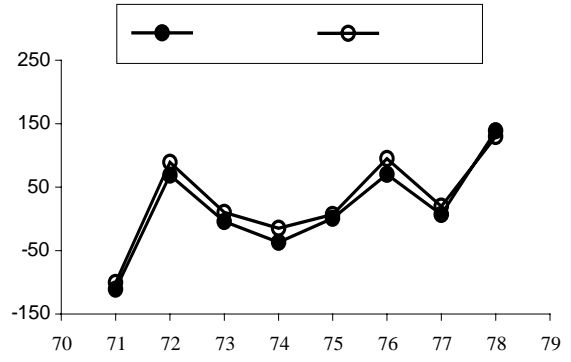
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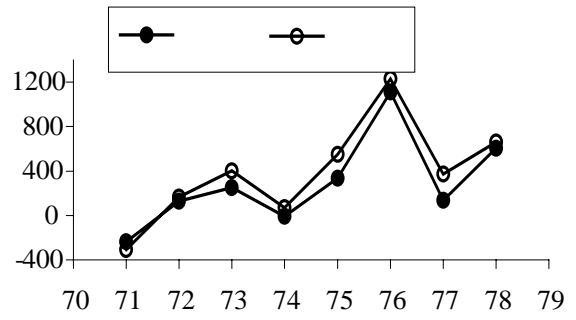
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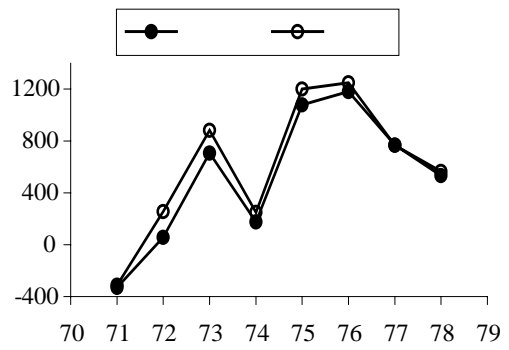
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