

An F-ratio based test of significant dominance and/or maternal effects ($\sigma_d^2 > \sigma_s^2$) was given by Equation 18.36. The expression in the book is incorrect and should read

$$F = \frac{c_d MS_d - c_s MS_s}{MS_e}$$

where

$$c_d = \frac{k_2 + k_3}{k_2 + k_3 - k_1} \quad \text{and} \quad c_s = \frac{k_1}{k_2 + k_3 - k_1}$$

The expectation of the above F statistic is as follows. Let $\sigma_d^2 = \sigma_s^2 + \theta^2$. The resulting EMS become

$$E[MS_s] = \sigma_e^2 + (k_2 + k_3)\sigma_s^2 + k_2\theta^2 \quad \text{and} \quad E[MS_d] = \sigma_e^2 + k_1\sigma_s^2 + k_1\theta^2$$

Thus,

$$E[c_d MS_d - c_s MS_s] = \sigma_e^2 + \left(\frac{k_1 \cdot k_3}{k_2 + k_3 - k_1} \right) \theta^2$$

giving

$$E[F] = 1 + \frac{\theta^2}{\sigma_e^2} \left(\frac{k_1 \cdot k_3}{k_2 + k_3 - k_1} \right)$$