a) $\log(S_1^2) + \frac{2p_1}{n} = AIC_1$

$\log(S_0^2) + \frac{2p_0}{n} = AIC_0$

$\log(S_0^2) + \frac{2p_0}{n} < \log(S_1^2) + \frac{2p_1}{n}$

$\log\left(\frac{S_0^2}{S_1^2}\right) < \frac{2(p_1 - p_0)}{n}$

$\left(\frac{S_0^2}{S_1^2}\right) < e^{\frac{2}{n}(p_1 - p_0)}$

b) $e^x \approx 1 + x$

therefore, $e^{2/n\,(p_1 - p_0)} \approx 1 + \frac{2}{n}(p_1 - p_0)$

$\frac{(S_0)^2}{(S_1)^2} = 1 + \frac{2}{n}(p_1 - p_0)$

$\frac{S_0^2 - S_1^2}{S_1^2} < \frac{2}{n}(p_1 - p_0)$

c) w.k.t $s^2 = e'e/(n-k)$

hence $s_0^2 = (e_0'e_0/n-p_0)$ $s_1^2 = \frac{e_1'e_1}{(n-p_1)}$

$\frac{S_0^2 - S_1^2}{S_1^2} = \frac{((e_0'e_0)/(n-p_0)) - ((e_1'e_1/n-p_1))}{(e_1'e_1/n-p_1)}$

hence $\frac{(e_0'e_0/n-p_0) - (e_1'e_0/n-p_1)}{(e_1'e_0/p-p_1)} < \frac{2}{n}(p_1 - p_0)$

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d) $F = \dfrac{(e_0'e_0 - e_1'e_1)/(P_1 - P_0)}{e_1'e_1\ (n-P_1)}$ $\dfrac{\text{var in first dataset}}{\text{var in second dataset}}$

We can approximate from (c)

$$\frac{(e_0'e_0 - e_1'e_1)/(P_1 - P_0)}{(e_1'e_1)/(n-P_1)} \leftarrow \frac{2}{n}(P_1 - P_0) \times \left(\frac{n-P_1}{P_1 - P_0}\right)$$

Hence when n large $\dfrac{2(n-P_1)}{n}$

$= 2\dfrac{\cancel{n}}{\cancel{n}}$

≈ 2

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