Extras

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Pooled Treatment Effect $= \sum_b \frac{n_b}{N} * \frac{Var(T_{i,b})}{Var(T_i)} * \hat{\Delta}_b$.

Question: Does $\sum_b \frac{n_b}{N} * \frac{Var(T_{i,b})}{Var(T_i)} = 1$?

Given: $\sum_b n_b = N$

$$\begin{aligned}\sum_b \frac{n_b}{N} * \frac{Var(T_{i,b})}{Var(T_i)} &= \sum_b \frac{n_b}{N} * \frac{Var(T_{i,b})}{Var(T_i)} \\ &= \sum_b \frac{n_b}{N} * \frac{p_b * (1-p_b)}{p * (1-p)}\end{aligned}$$

Assume $n_b = N/b$. (All the blocks have equal size)

$$\begin{aligned}\sum_b \frac{n_b}{N} * \frac{p_b * (1-p_b)}{p * (1-p)} &= \sum_b \frac{N/b}{N} * \frac{p_b * (1-p_b)}{p * (1-p)} \\ &= \sum_b \frac{1}{b} * \frac{p_b * (1-p_b)}{p * (1-p)}\end{aligned}$$

Let $b = 2$, $p_1 = 0.8$ and $p_2 = 0.4$

Additionally $p = 0.6$. This is because you have a 50 percent chance of landing in group 1 or a 50 percent chance in landing in group 2. This implies probability of treatment equals $0.5 * 0.8 + 0.5 * 0.4 = 0.6$

$$\sum_b \frac{1}{b} * \frac{p_b * (1-p_b)}{p * (1-p)} = \frac{1}{2} * \frac{0.8 * (1-0.8)}{0.6 * (1-0.6)} + \frac{1}{2} * \frac{0.4 * (1-0.4)}{0.6 * (1-0.6)}$$

Top of Fraction

$$0.5 * 0.8 * (1-0.8) + 0.5 * 0.4 * (1-0.4)$$
$$0.08 + 0.12$$
$$0.2$$

Bottom of Fraction

$$0.6 * (1-0.6)$$
$$0.24$$

This means the weights sum to be

$$\frac{0.2}{0.24} = 0.833$$