Sample size selection for ratio estimation

To select a sample size for ratio estimation of R, τ_y,or μ_y, we can set up an equation of the form: $2\sqrt{V(r)} = B$ and solve for B. The solution is:

$$n = \frac{N\sigma^2}{ND + \sigma^2}, \text{ where } D = \begin{cases} B^2\mu_x^2/4 & \text{for } R, \\ B^2/4 & \text{for } \mu_y, \\ B^2/4N^2 & \text{for } \tau_y. \end{cases}$$

Note that recent printings of our text have had misprints in this section, using n instead of N in the numerator of the sample size expression. The estimate of σ^2 is obtained from prior data or a pilot sample,

$$\widehat{\sigma}^2 = \frac{\sum_{i=1}^{n'} (y_i - r\ x_i)^2}{n' - 1}.$$

Notice that our previous approximation to σ, $\sigma \approx$ range/4, is not appropriate in this case.

Example 6.4 page 194: $R =$ (worker hours lost this year)/(worker hours lost last year),