G&S Ch3, example 3.11 simulation

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On page 2 is the recreated graph from Example 3.11.

I've used n = the number of subjects (100).
And k = the number of subjects who reported a difference with the improved medicine. And thus, p = k/n.

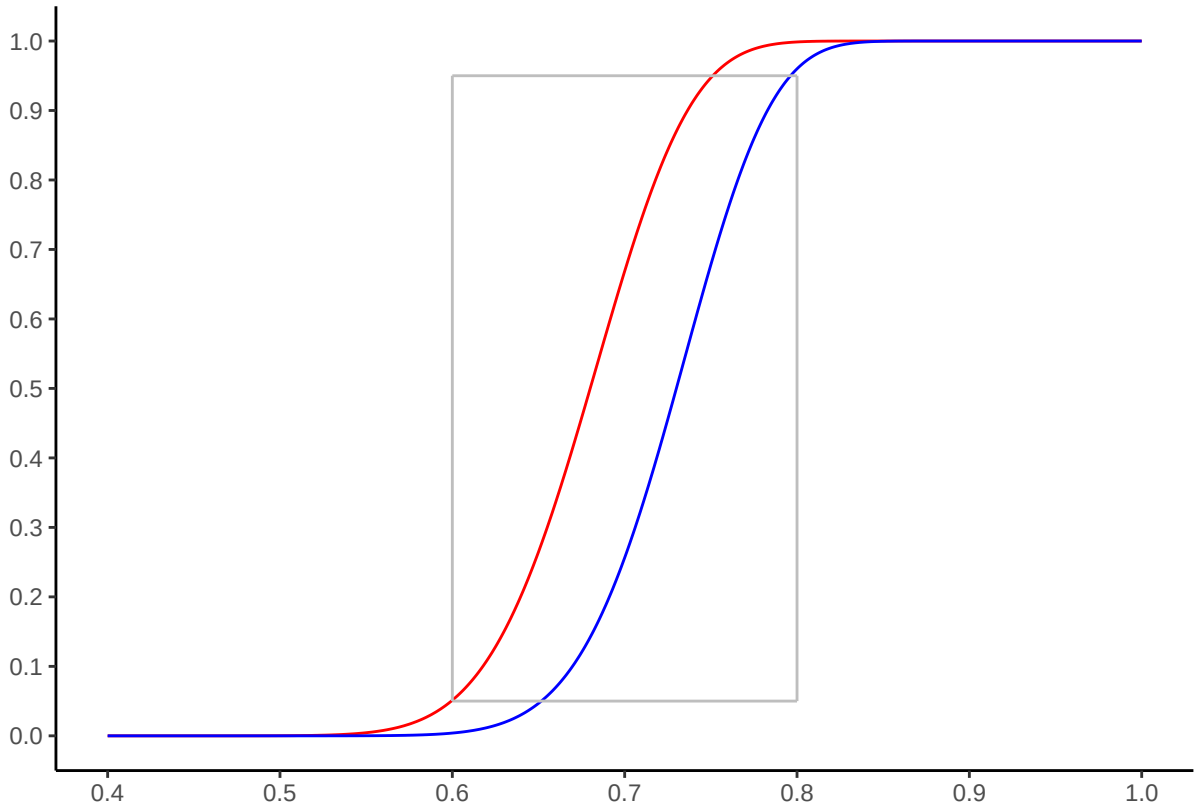
The red curve is a power curve for when m=68. I found this value of m by coding a loop (for k = 1 to 100) that compared the binomial cdfs for k=1 unti k=100. I'm using p_null (p=.06) here because I'm looking for the Type I error (false positives - so I'm using the "positive", or p_null and looking for the right tail.) In this loop when (1 - the binomial cdf) got smaller than 0.05 I broke the loop and stored k into m1. And m1 was 68.

The blue curve is a power curve for when m=73. I found this value of m by coding a loop (for k = 1 to 100) that compared the binomial cdfs for k=1 until k=100. I'm using the largest p_alt (p=.08) here because I'm looking for the Type II error (false negatives - so I'm using the "negative", or p_alt and looking for the left tail.) In this loop when the binomial cdf got smaller than 0.05 I broke the loop and stored k into m2. And m2 was 73.

Though not labeled in the book, the x-axis is showing the alternative probilities (p_alt) which we are testing against. And for this example, the authors are looking at the range from a alternative hypothesis of p=.06 up to the alternative hypothesis of p=.08. These are the left and right sides of the grey rectangle on the graph.

The y-axis is showing the power, which is 1-β (where β is the Type II error). The top side of the grey box is showing where the power = 0.95 (and where the Type II error = 0.05). For the blue graph (m=73), the intersection with the top of the rectangle is showing where the power of the test is 0.95 against an alternative hypothesis of p_alt=0.8. We could find where the m=68 power curve reaches a 0.95 power against p_alt=?, by finding the intersection between the red curve and the top side of the grey box. (p_alt=?, 0.95)

The lower side of the rectangle is showing the minimum acceptable alpha level (Type I error) for each curve. BUT since Type I error is false positive, we're looking for when p_null is true (here it's p=.6). So there is no "against an alternative result" when calculating Type I error. Type I error is calculated against the null hypothesis, and the actual alternative is irrelevant. Thus where the blue curve crosses the lower side of the grey rectangle is meaningless.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