Output from Program BowlGraphsExamples.sas

This ouput is from a program in the Supplementary Information for the paper "The Optimal Threshold p-Value for a Scientific Journal" by Donald B. Macnaughton.

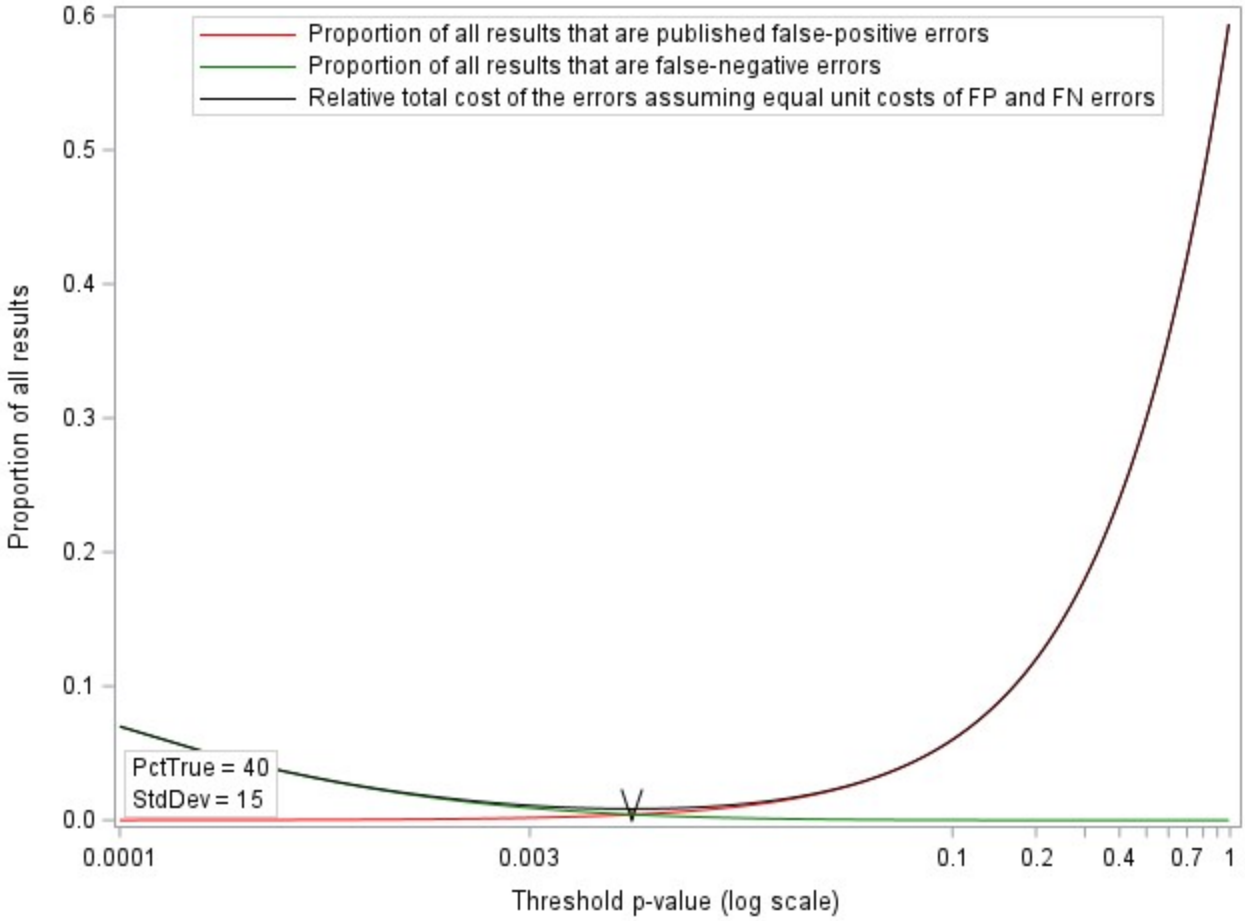
This output is easiest to understand if it is viewed in a PDF reader that can display a full page and that can turn pages so that each page exactly overlays the preceding page when the page is turned. Under those conditions you can turn the pages quickly and see how the vertical arrow on the pages moves around. Otherwise, you can drag the vertical slider to quickly scroll through the graphs.

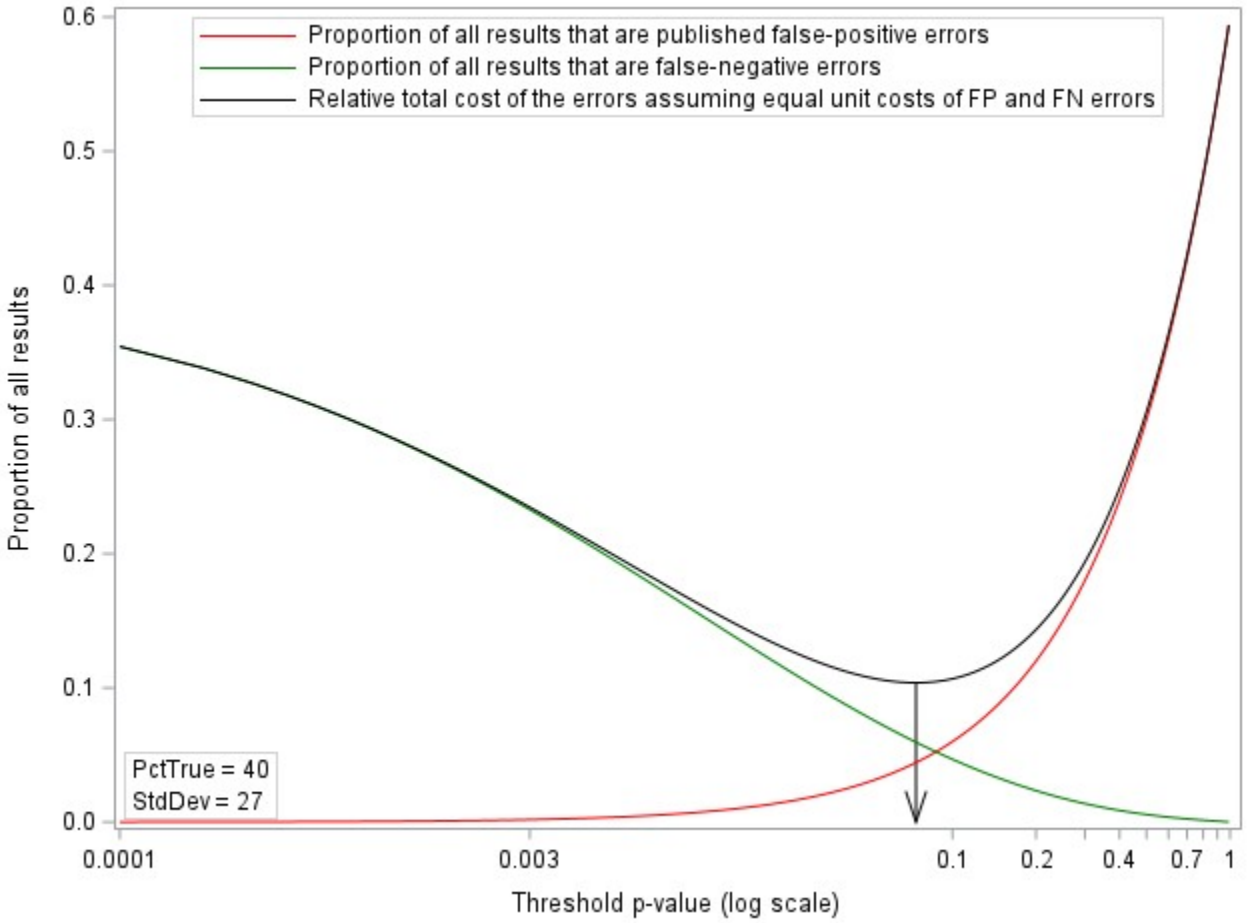
The bowl depicted by the black line on each graph shows the sum of the costs of the false-positive and false-negative errors as a function of the threshold p-value. The lowest point on the bowl (identified by the downward-pointing arrow on each graph) indicates the optimal threshold p-value for the studied journal in this case. We see how the optimal threshold p-value changes as the values of the parameters of the situation change. The values of the changing parameters of the situation depicted on each graph are given in the inset in the lower-left corner of the graph.

The following 15 graphs reflect three series, with five graphs in each series. In the first series, the percentage of research hypotheses in the field that are true is assumed to be 40%, as indicated by PctTrue in the inset on each graph. In the second series, the percentage true is assumed to be 50%, and in the third, the percentage true is assumed to be 60%. The five graphs in each series show the correct graph when the standard deviation has each of five different values, ranging from 15 up to 500, as indicated by the StdDev value in the inset. The value of meandiff is 20. So, if the standard deviation is 500, then the effect is very small relative to the noise, making it effectively non-existent--i.e., there is effectively no relationship between the two variables.

The main takeaway from these graphs is that the optimal threshold p-value moves around depending on the values of the parameters.

It is easy rerun this program with different groups of values of the parameters to see what happens. To do that, find the program in the Supplementary Information for the paper, change the specifications of the three DO statements at the beginning of the program, and then run the program. Instructions to run SAS programs using free online SAS software are in the Supplementary Information for the paper.


Proportion of all results that are published false-positive errors
Proportion of all results that are false-negative errors
Relative total cost of the errors assuming equal unit costs of FP and FN errors
Proportion of all results
0.6
0.5
0.4
0.3
0.2
0.1
0.0
PctTrue = 40
StdDev = 15
0.0001
0.003
0.1
0.2
0.4
0.7
1
Threshold p-value (log scale)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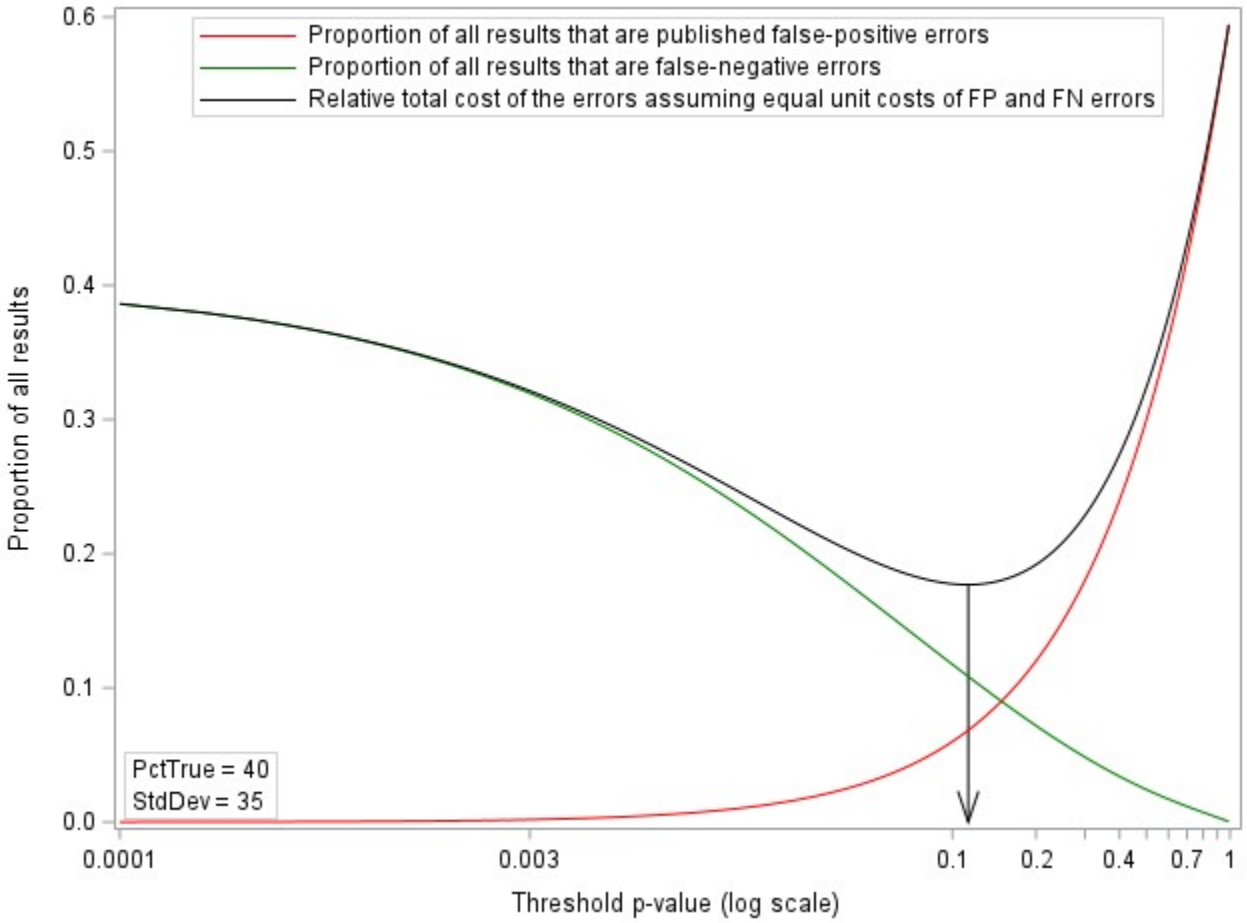
Relative total cost of the errors assuming equal unit costs of FP and FN errors
Proportion of all results
0.6
0.5
0.4
0.3
0.2
0.1
0.0
PctTrue = 40
StdDev = 27
0.0001
0.003
0.1
0.2
0.4
0.7
1
Threshold p-value (log scale)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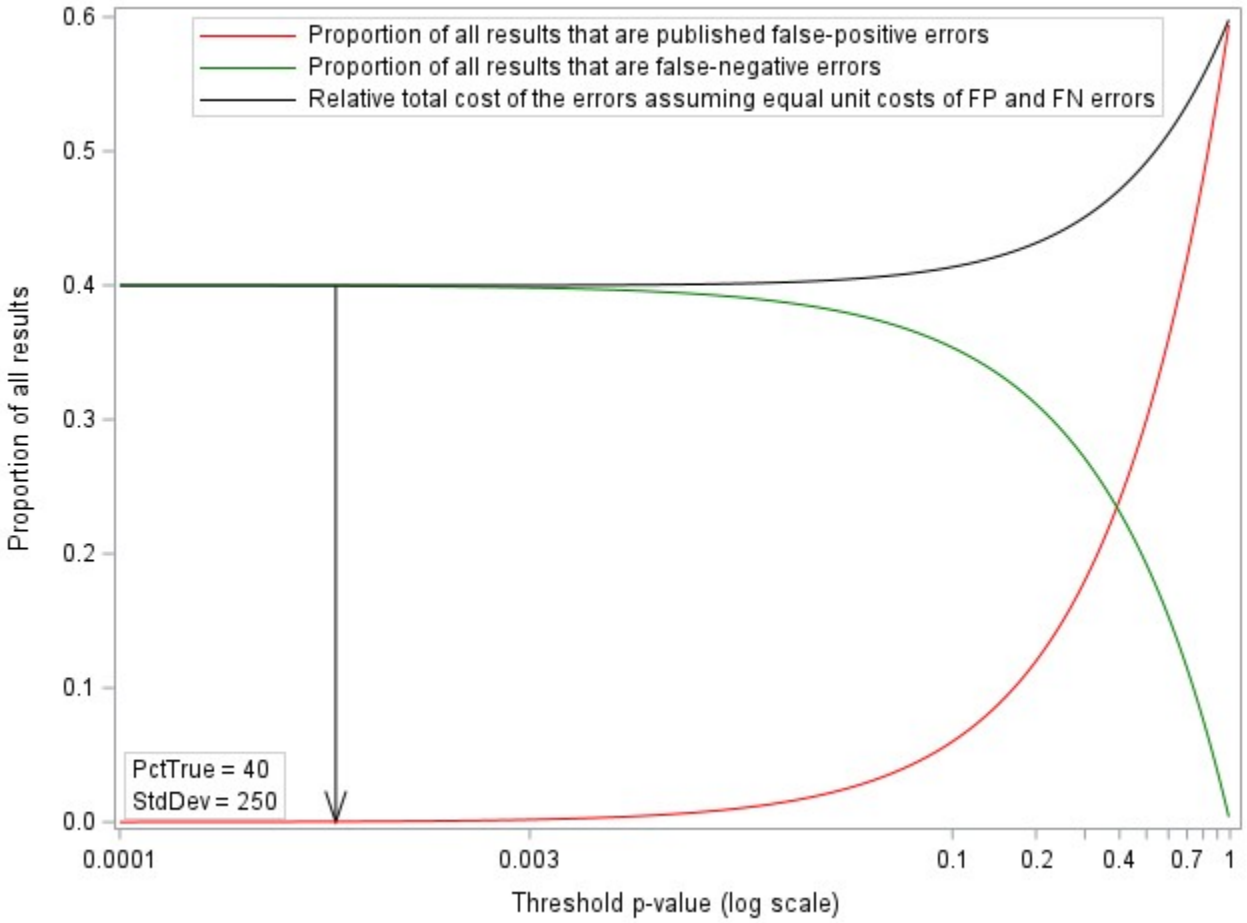
Relative total cost of the errors assuming equal unit costs of FP and FN errors
Proportion of all results
0.6
0.5
0.4
0.3
0.2
0.1
0.0
PctTrue = 40
StdDev = 35
0.0001
0.003
0.1
0.2
0.4
0.7
1
Threshold p-value (log scale)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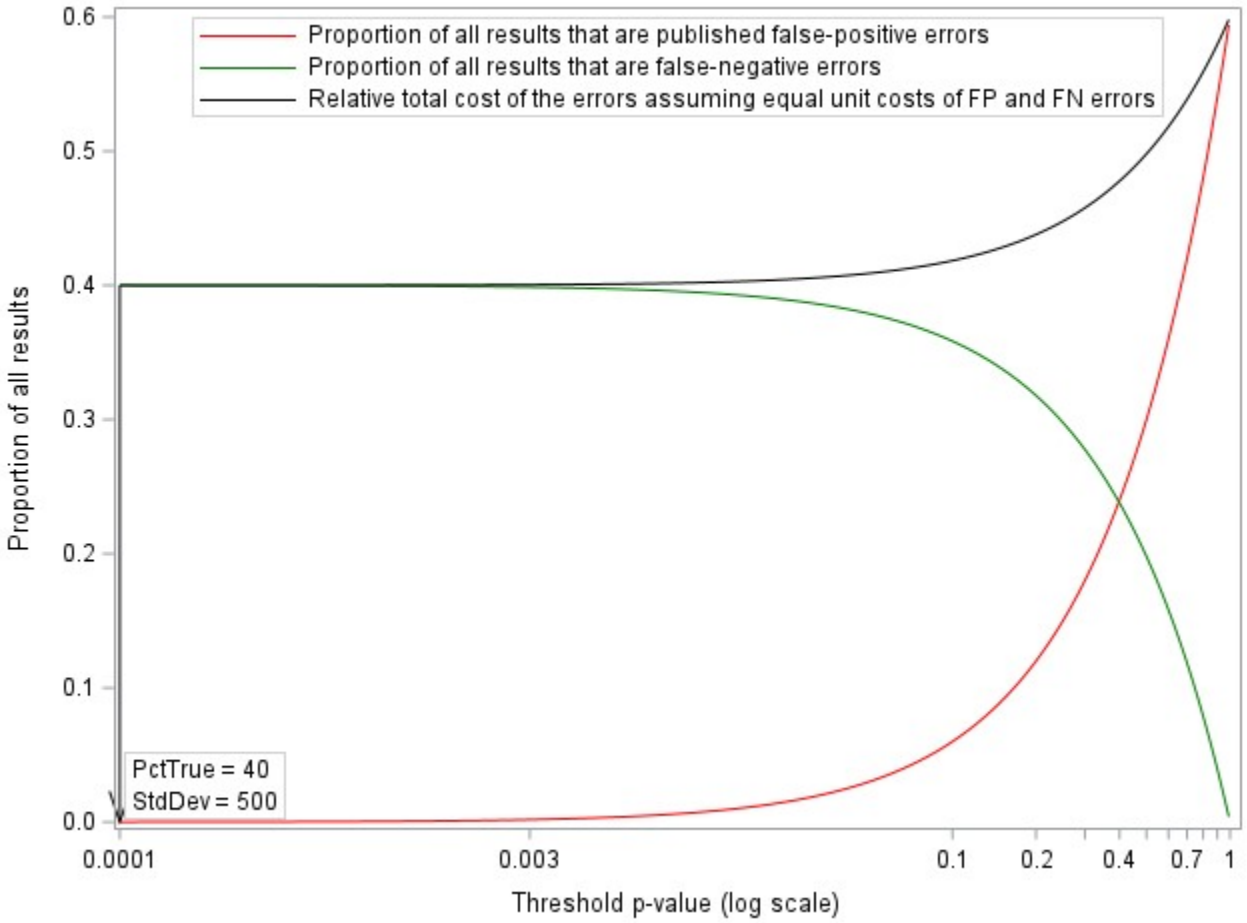
Relative total cost of the errors assuming equal unit costs of FP and FN errors
Proportion of all results
0.6
0.5
0.4
0.3
0.2
0.1
0.0
PctTrue = 40
StdDev = 250
0.0001
0.003
0.1
0.2
0.4
0.7
1
Threshold p-value (log scale)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Proportion of all results
0.6
0.5
0.4
0.3
0.2
0.1
0.0
PctTrue = 40
StdDev = 500
0.0001
0.003
0.1
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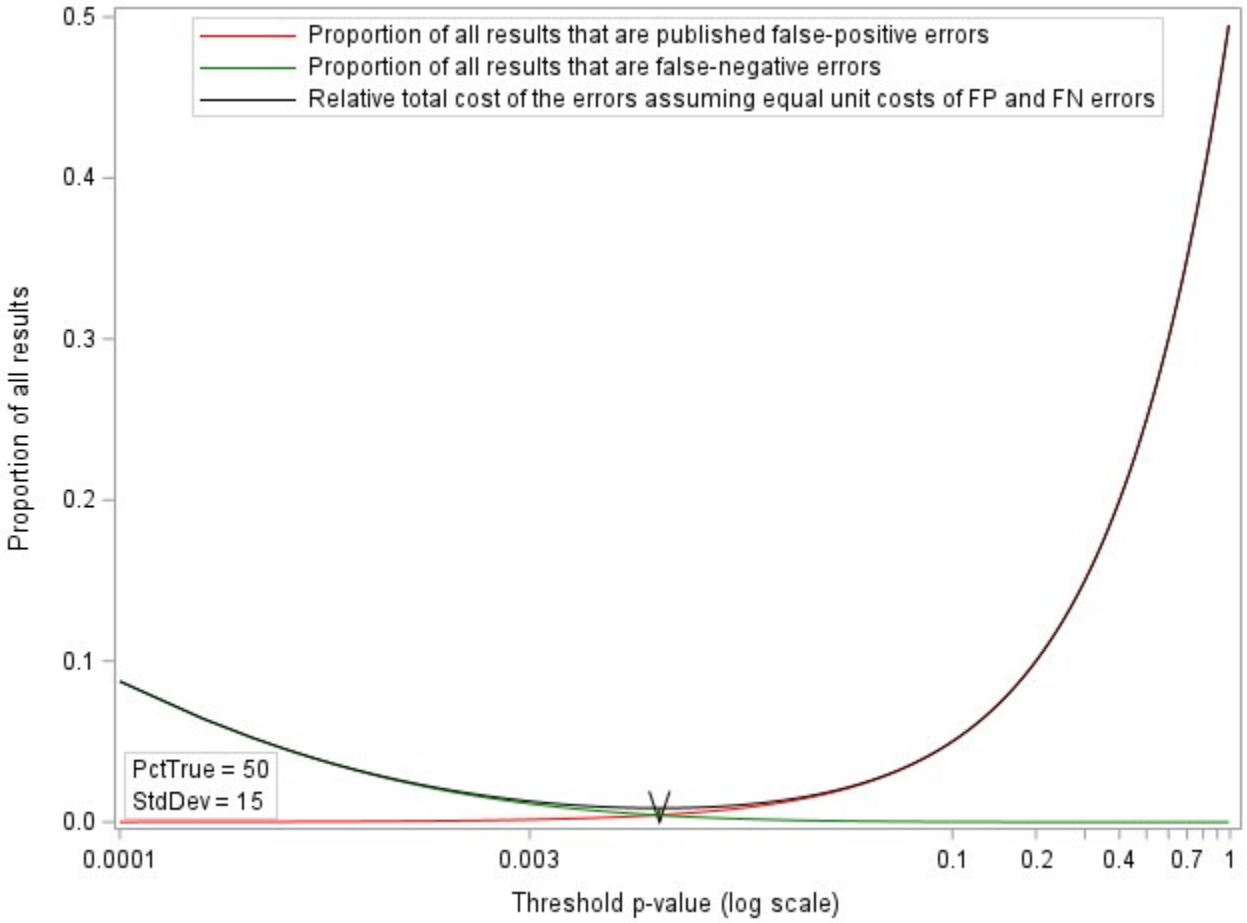
0.4
0.7
1
Threshold p-value (log scale)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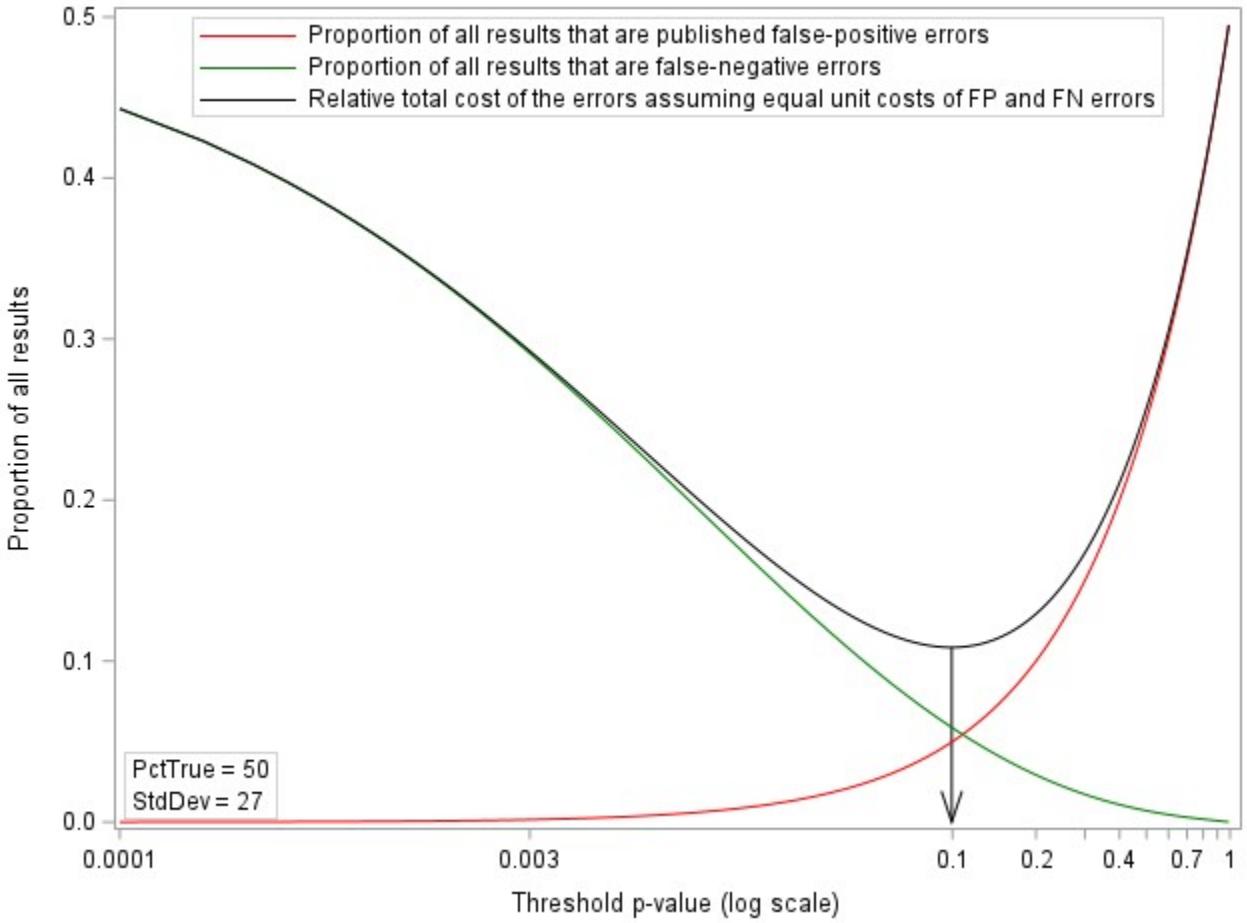
Relative total cost of the errors assuming equal unit costs of FP and FN errors
Proportion of all results
0.5
0.4
0.3
0.2
0.1
0.0
PctTrue = 50
StdDev = 15
0.0001
0.003
0.1
0.2
0.4
0.7
1
Threshold p-value (log scale)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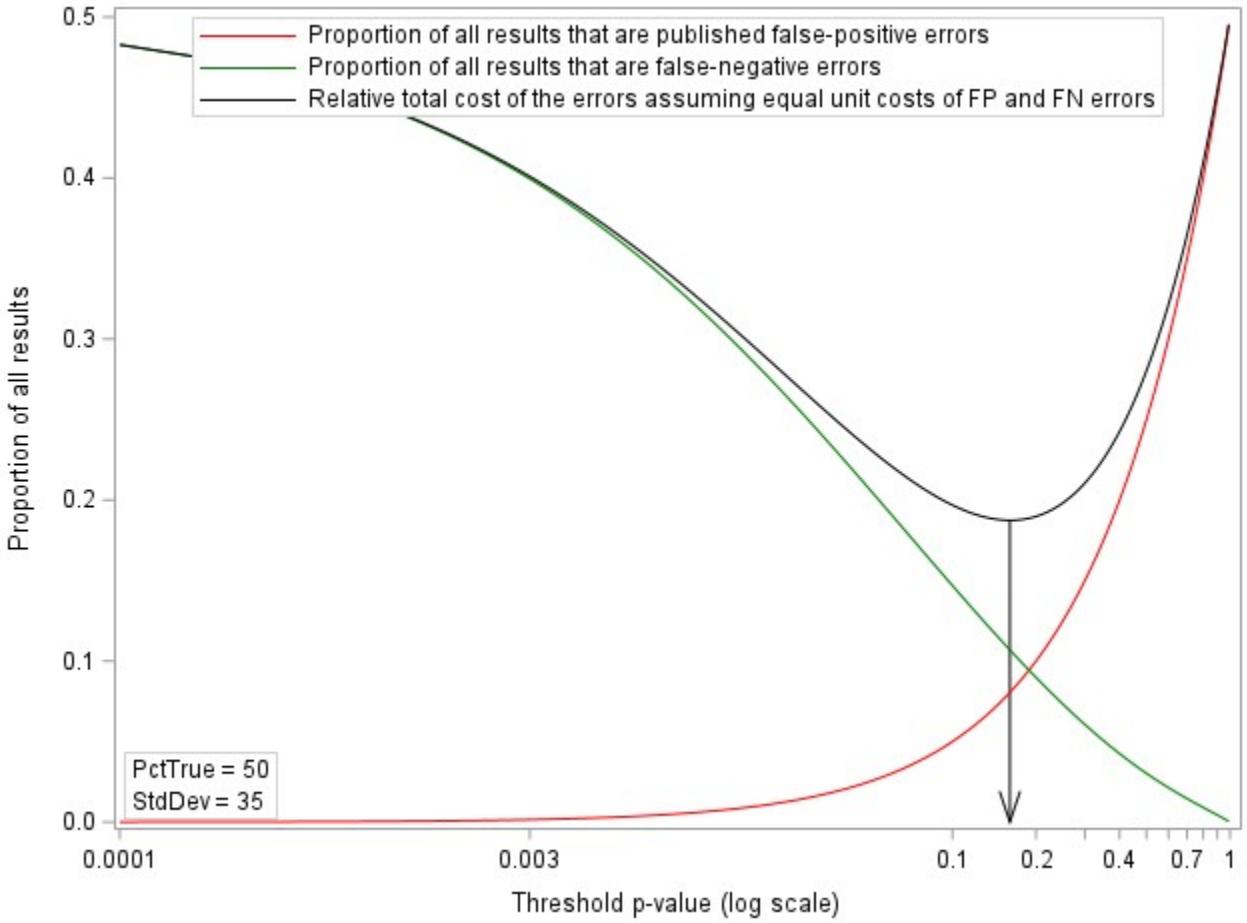
Threshold p-value (log scale)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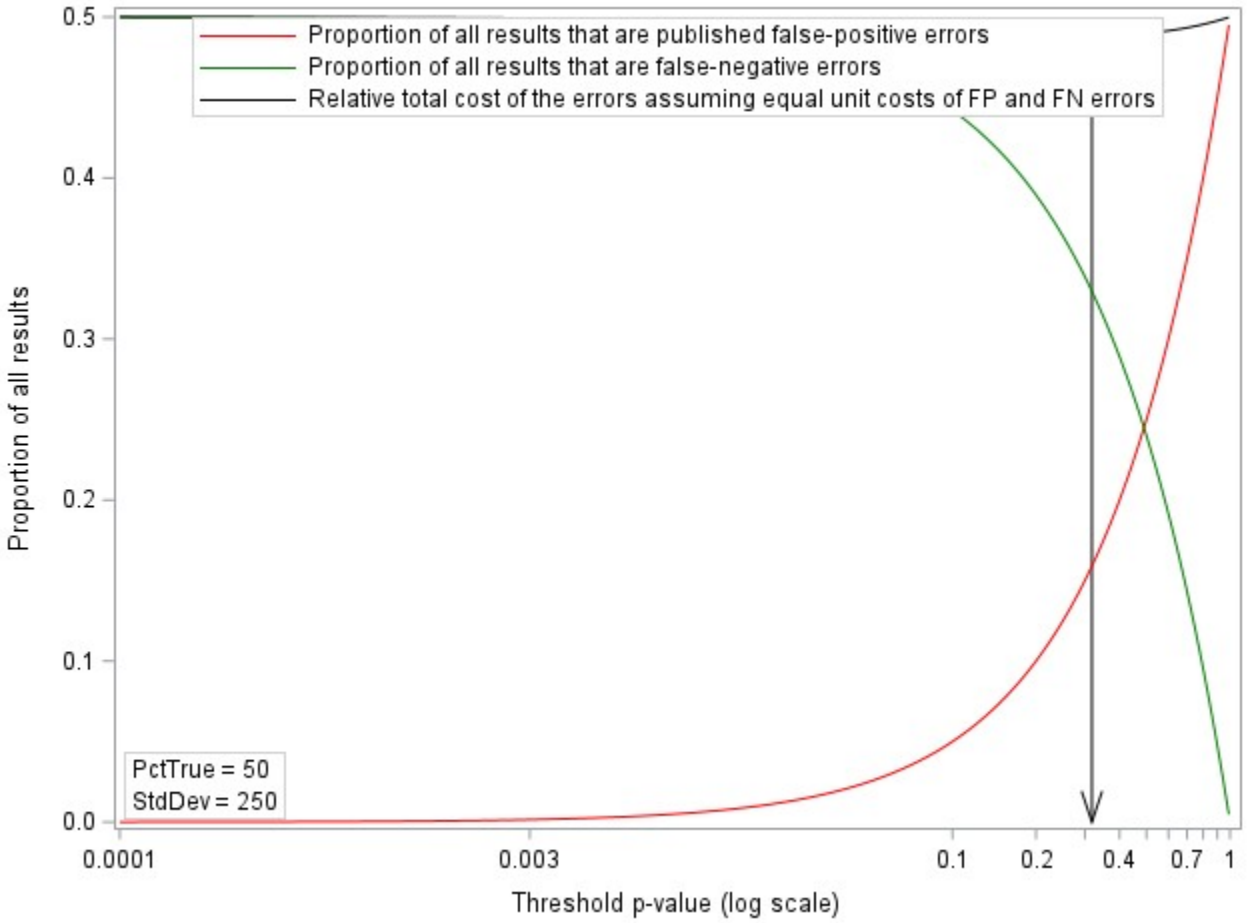
Threshold p-value (log scale)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PctTrue = 50
StdDev = 250
0.0001
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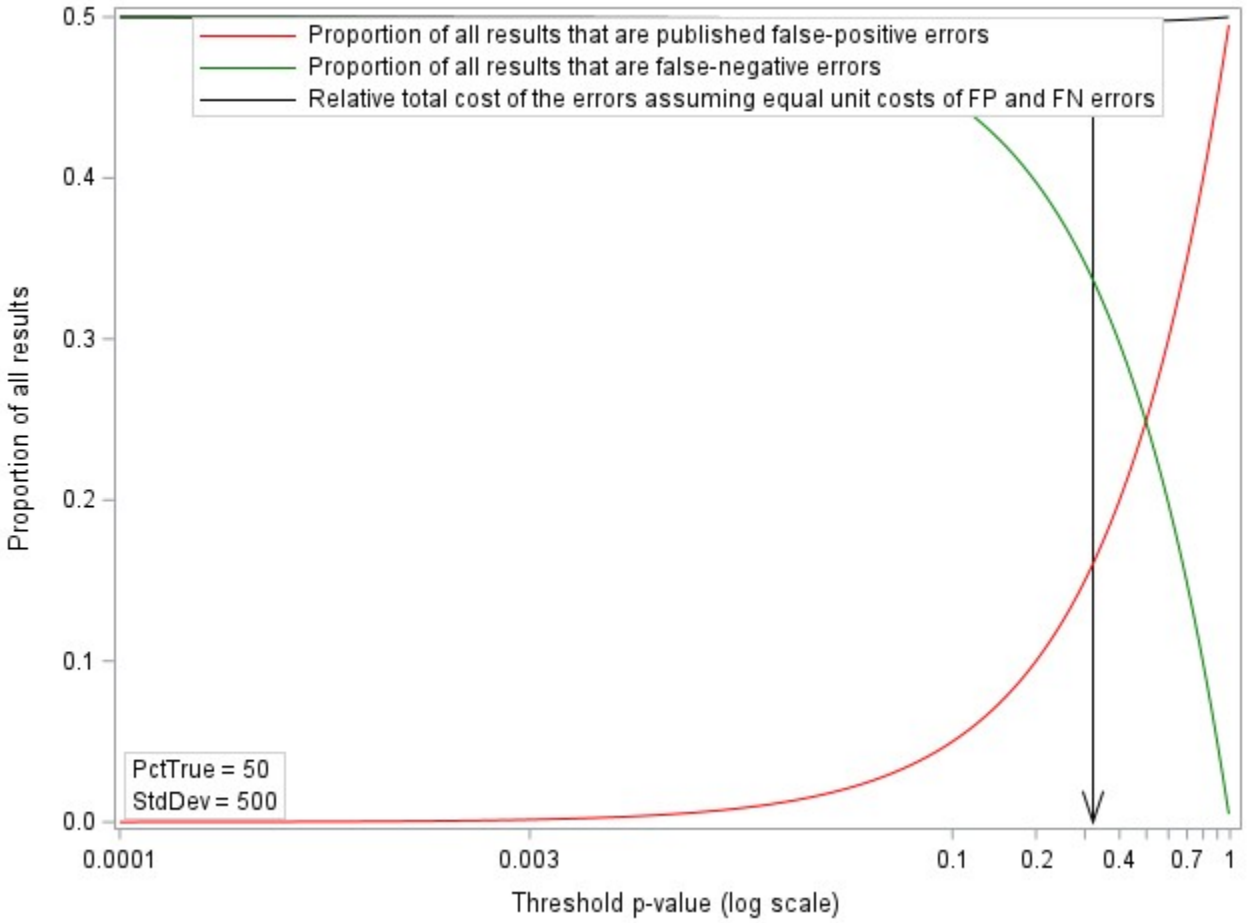
Threshold p-value (log scale)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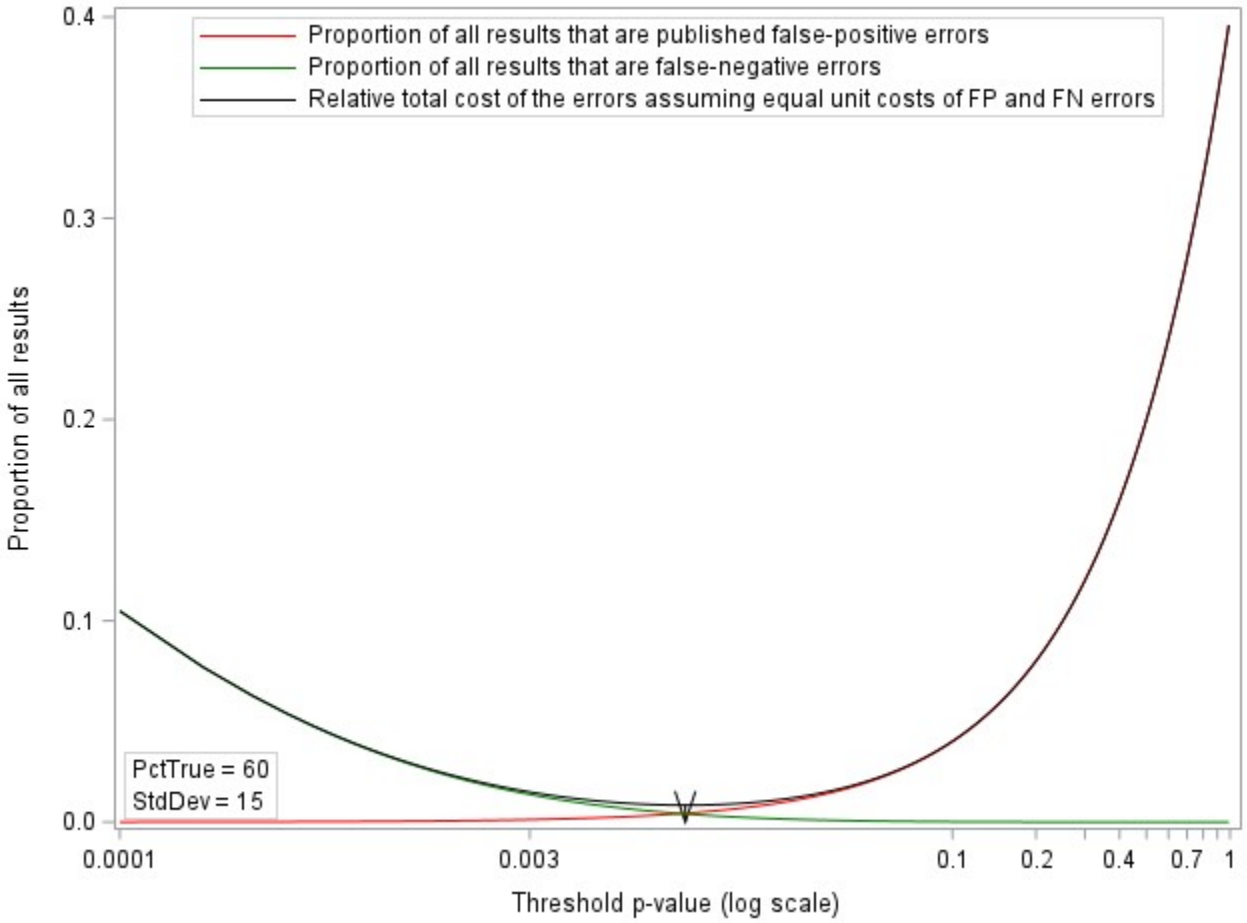
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Relative total cost of the errors assuming equal unit costs of FP and FN errors
Proportion of all results
0.4
0.3
0.2
0.1
0.0
PctTrue = 60
StdDev = 15
0.0001
0.003
0.1
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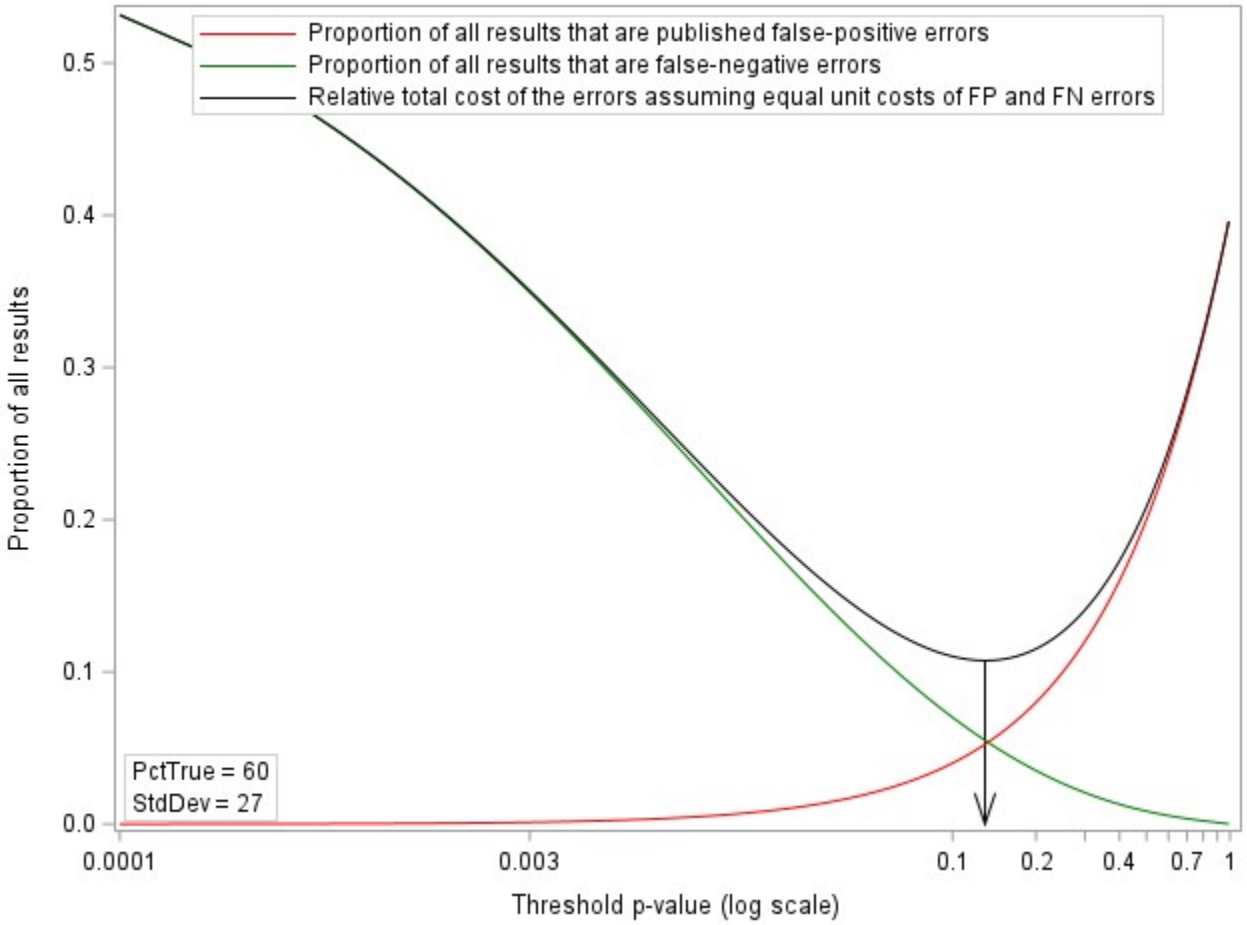
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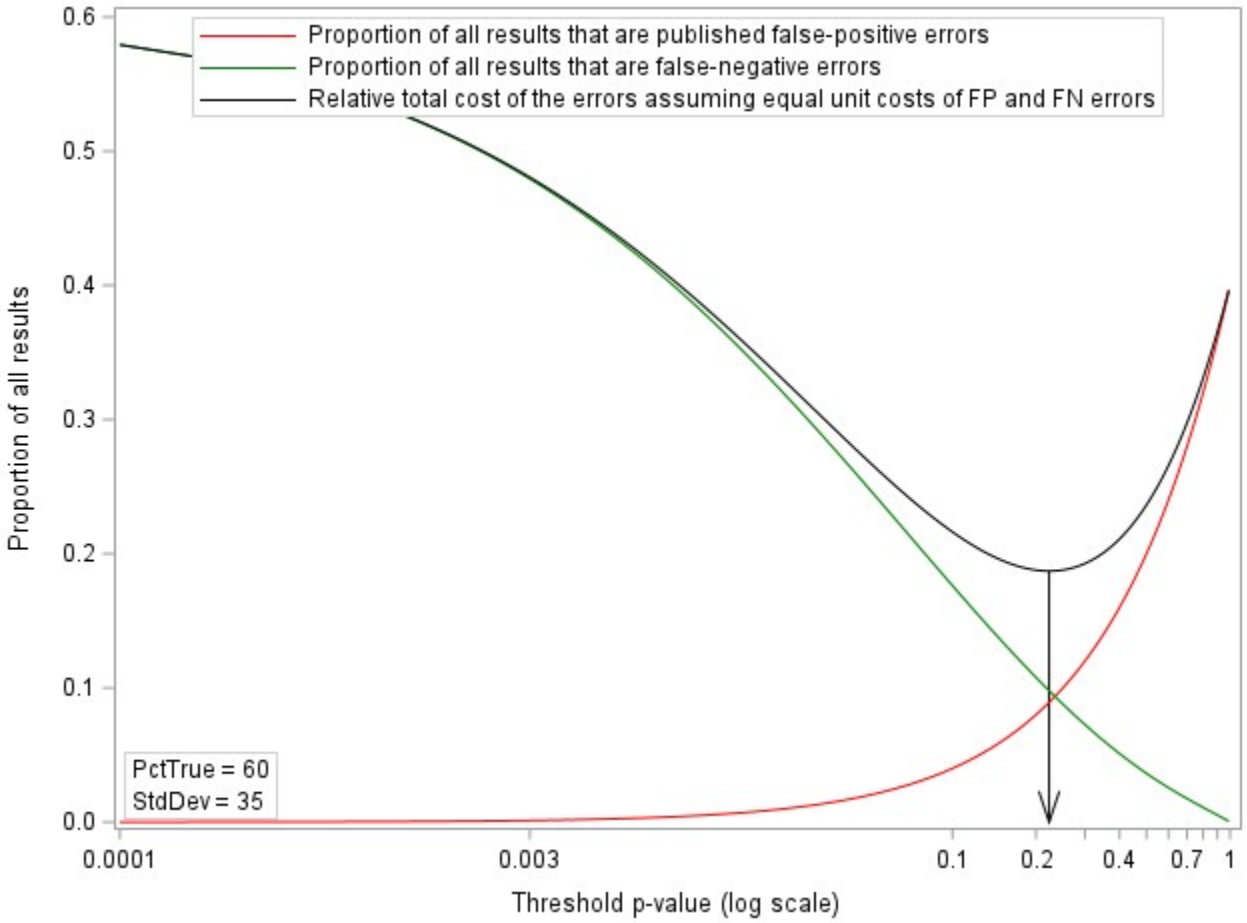
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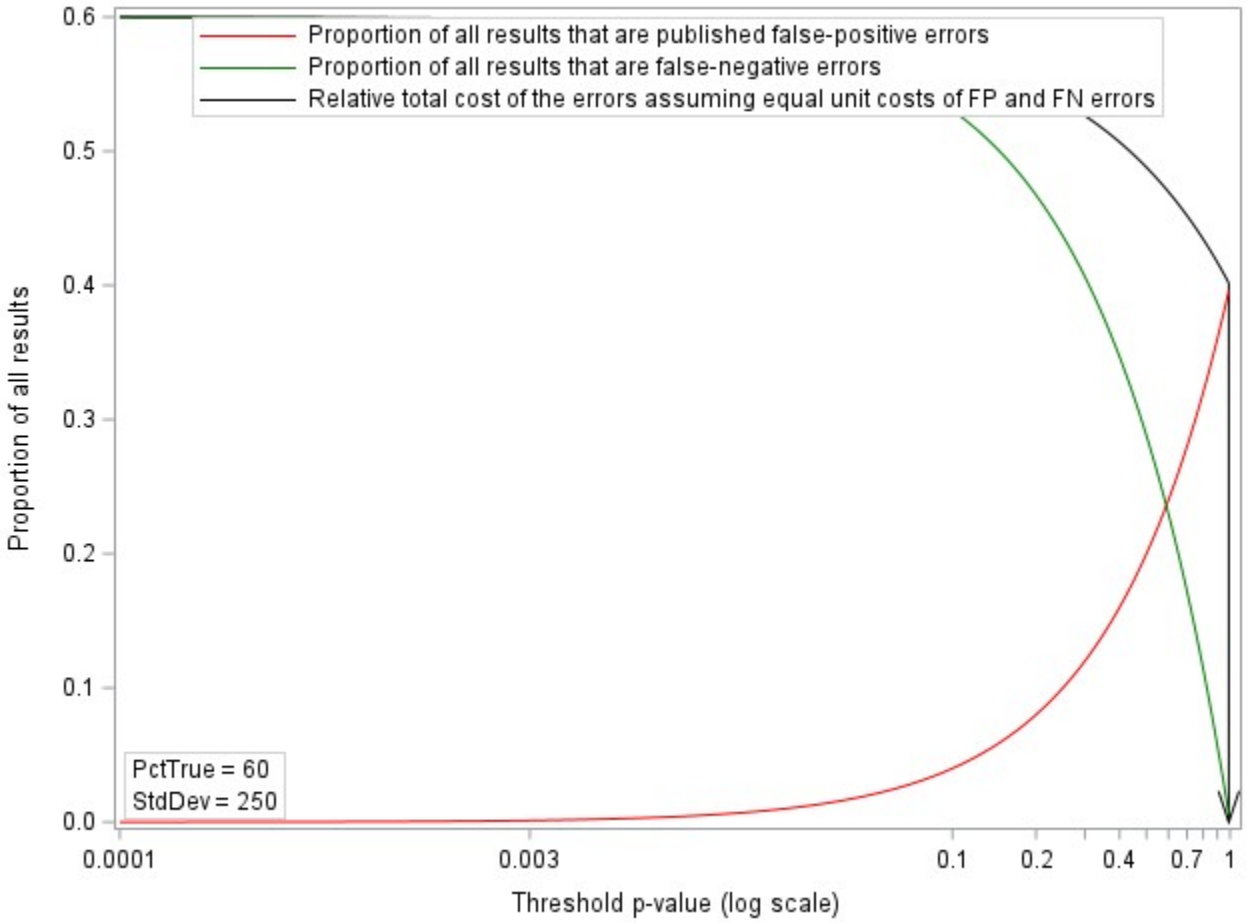
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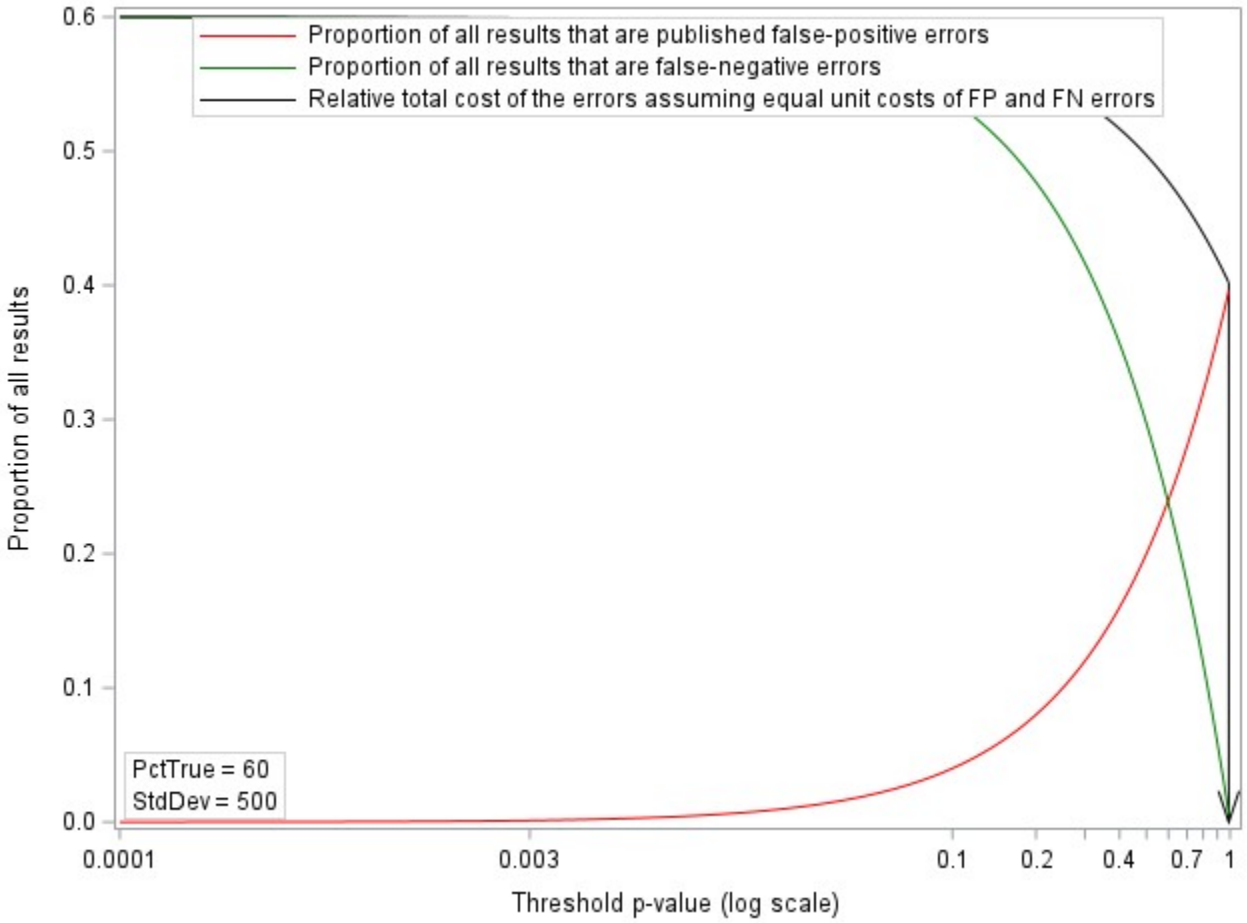
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