Should We Be Biased Toward Birdie Holes?

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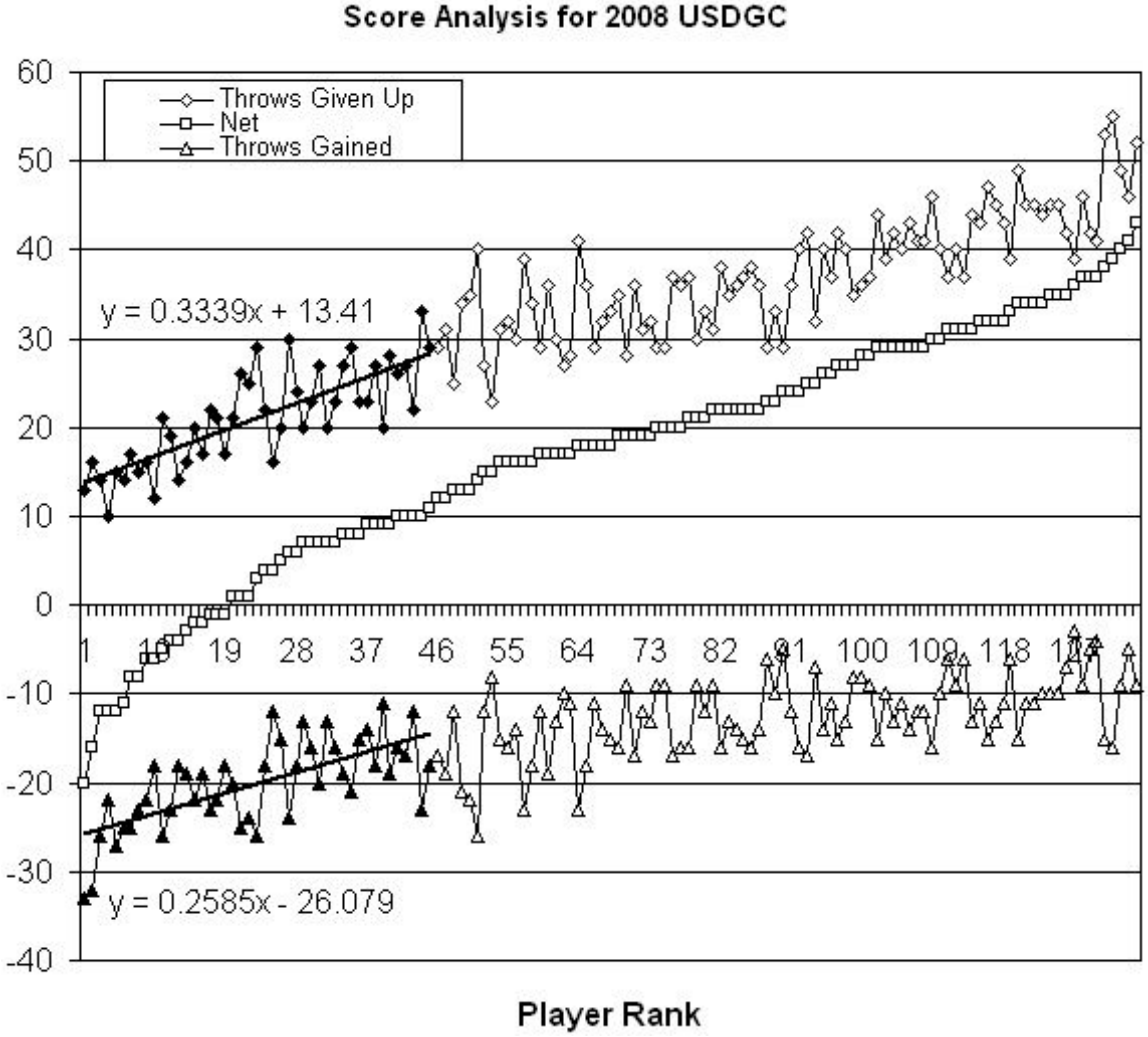
Chuck Kennedy has put forth the idea that disc golf holes that produce a lot of birdies are better at separating out the top third of players, by giving the better players enough opportunities to advance against the field, and so that the lesser players cannot advance with just a few lucky birdies.

While that sounds perfectly reasonable, it is the kind of intuitive, plausible-sounding conjecture that I have found doesn't always hold up. So, I tried to find evidence for it.

I first looked at whether players actually advance by getting birdies, or from avoiding bogeys. I used the data from the 2008 USDGC. If the effect is real, it should show up at a major tournament like this – or else, what good is it?

All scores that were less than the modal score are "getting birdies", and all scores that are higher than the mode are "getting bogeys". One could use par, or average, or any other benchmark; the results would be the same.

The following graph shows the total throws that each player gained on the field, or lost against the field, by getting a score other than the benchmark.



At first glance, it does appear that getting birdies is more important to top players than avoiding bogeys, because the net effect for the best players (left side) is close to the effect of birdies, while the net effect for the worst players is close to the effect of the bogeys. However, that is deceiving, or a tautism or something.

To see why, look at the worst players, from about 91 over. The number of birdies among that group fluctuates around 5 to 15. These players get worse scores by getting more bogeys, not by getting fewer birdies. Thus, the movement up or down in the ranks for this group is determined by the number of bogeys. In other words, the slope of the graph of the bogeys is close to the slope of the final scores of these players. It is the *slope* of the graphs of the birdies and bogeys that shows how important each is, not the distance from the net score to either graph.

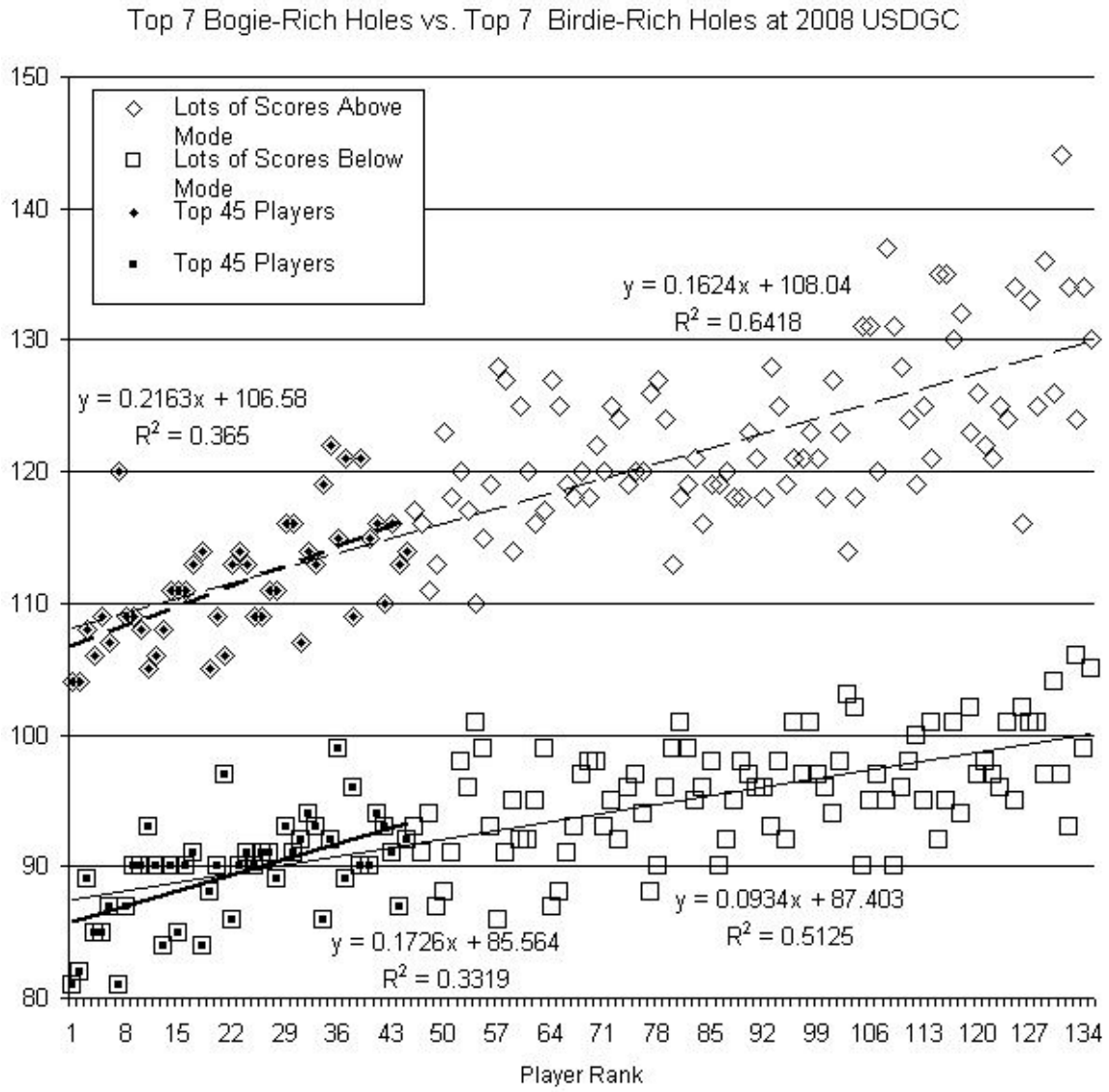
So, we can look at the top third of players to see which has the greater slope, the graph of birdies made, or bogeys avoided. It turns out that the graph of bogeys avoided has the

steeper slope. Thus, at the 2008 USDGC championship at least, the best players advanced against each other *more* by avoiding bogey (and higher) scores than they did by getting birdie (or better) scores.

This could be due to the design of the course – perhaps there just aren't enough opportunities for birdies.

So, I looked at the 7 holes where there were actually more scores below the mode than above (more birdies than bogeys). I compared these to the 7 holes where there were the most scores above the mode (two of these holes had no scores below the mode at all).

The following graph shows the scores the players would have received on these two different 4-round, 7 hole tournaments.



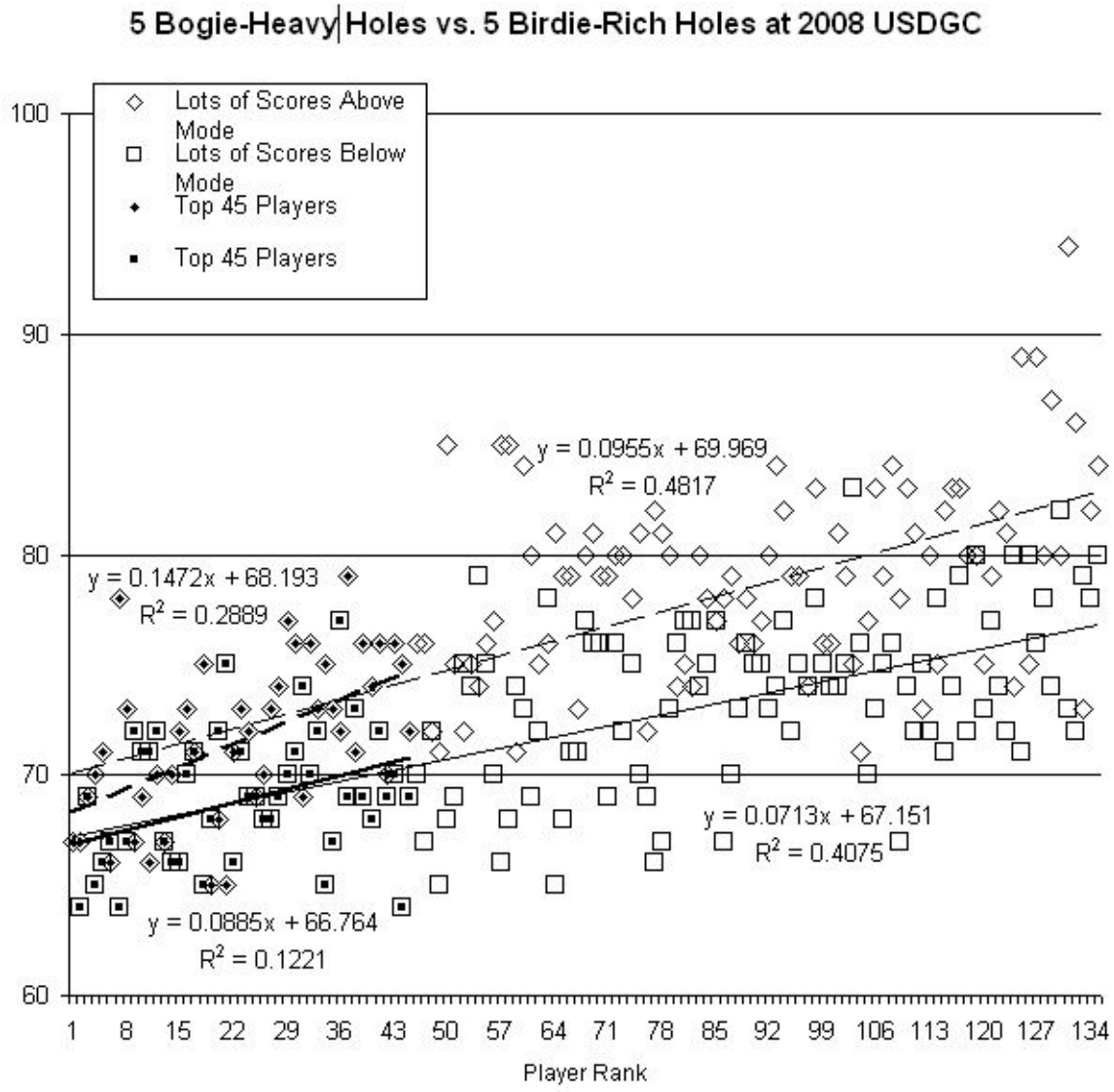
The scores on the Birdie-rich holes had a lower correlation with the actual ranking of all players, and also a lower correlation with the actual ranking of the top third of the players. The Birdie-rich holes also produced narrower Scoring Spreads for all players (17.7 compared to 25.3 for the Bogey-heavy holes), and for the top third of players (4.9 compared to 7.9).

What is more, 12 of the players from the bottom two-thirds of the field scored in the top third according to the Birdie-rich holes. But the Bogey-heavy holes only allowed 7 players to sneak into the top third.

All these results could have been because the Bogey-heavy holes had a higher average score.

So, I selected a set of holes that have almost the same average score. I found 5 Birdie-rich holes with a combined average score of 3.6 and 5 Bogey-heavy holes with a combined average score of 3.8.

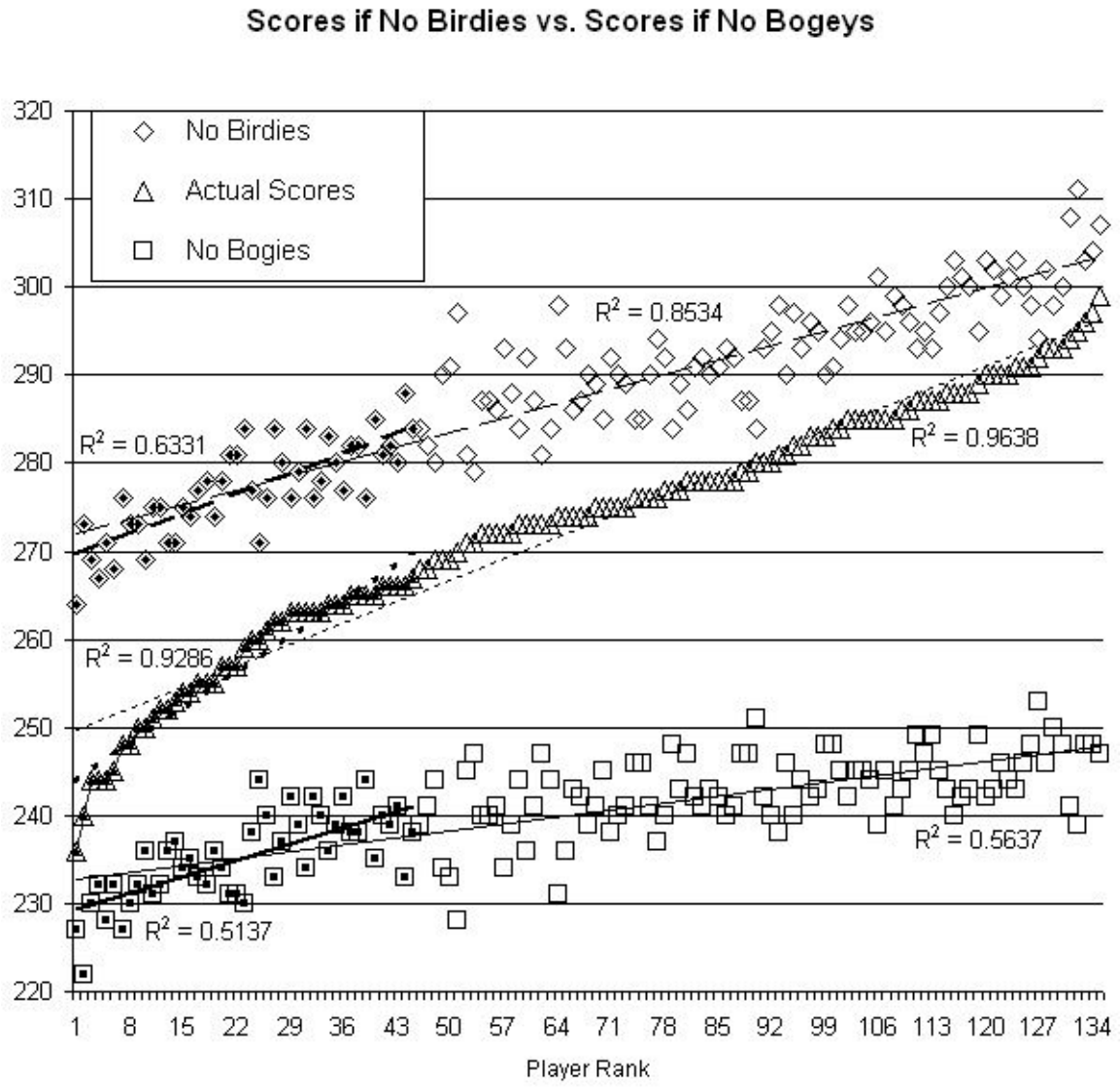
The following graph shows the scores the players would have received on these two 4-round, 5 hole tournaments.



Again, the scores on the Birdie-rich holes had a lower correlation with the actual ranking of all players, and also a lower correlation with the actual ranking of the top third of the players. Again, the Birdie-rich holes also produced narrower Scoring Spreads for all players (16.1 compared to 18.9 for the Bogey-heavy holes), and for the top third of players (4.6 compared to 5.7). Again, the Birdie-rich holes let more lower-level players sneak into the top third (15 compared to 11).

For another test, I found out what would have happened at the 2008 USDGC if no one ever got a birdie and if no one ever got a bogey. I simply replaced all the birdies (and lower) with the mode, and the obverse for bogeys.

Below is the chart with the results.

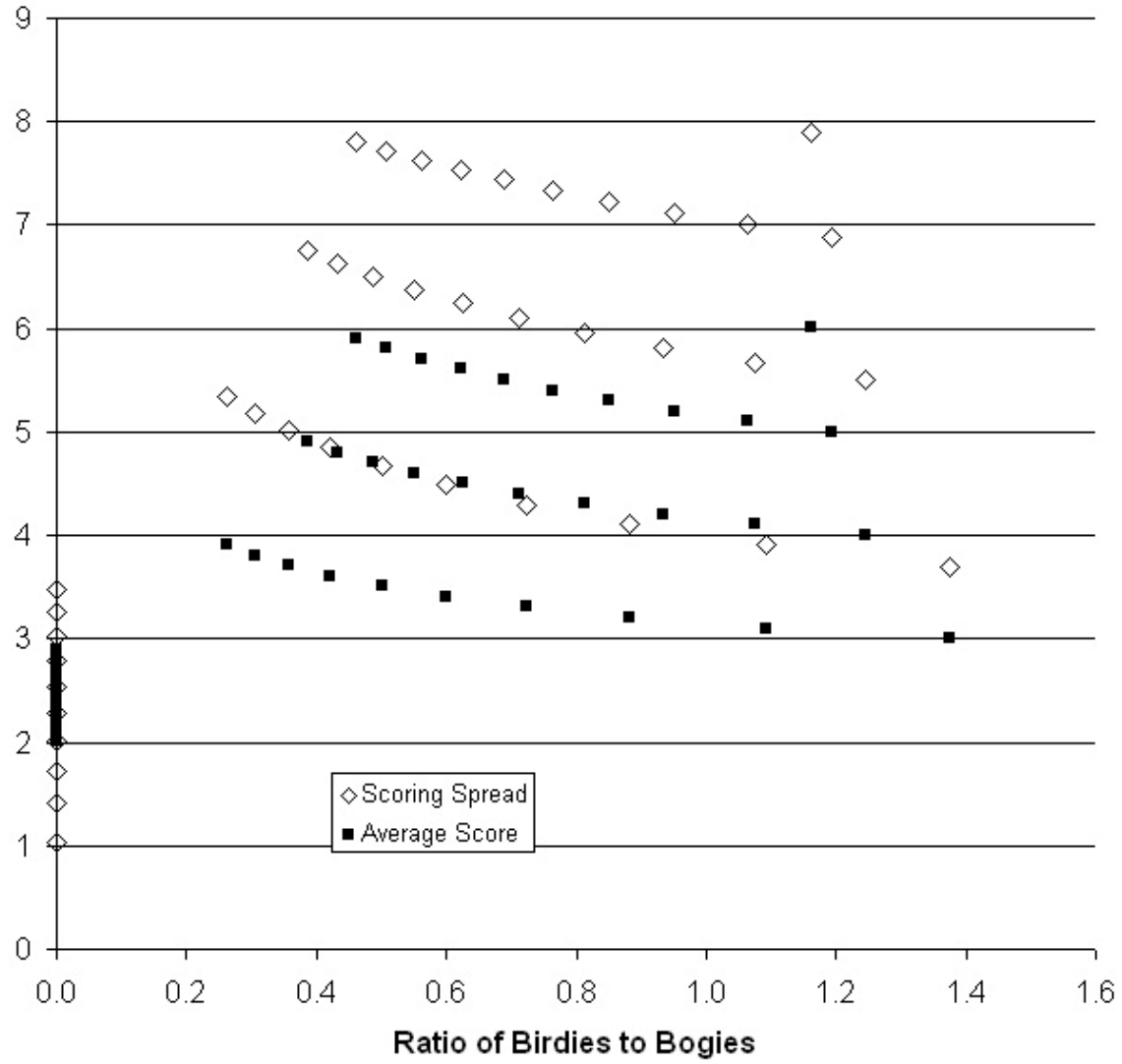


Again, the scores on the Birdie-rich (No Bogey) holes had a lower correlation with the actual ranking of all players, and also a lower correlation with the actual ranking of the top third of the players. Again, the Birdie-rich holes also produced narrower Scoring Spreads for all players (20.5 compared to 32.7), and for the top third of players (8.0 compared to 12.9). *However*, in this case the Birdie-rich holes let *fewer* players slip into the top third (only 7 compared to 10 for the "No Birdie" (Bogey-heavy) holes.

Note that in spite of the absence of a lot of birdies, these 10 players did not get into the top third because of Chuck's "few lucky birdies" -because there were no Birdies at all.

I also wonder if it is even possible to design holes for a lot of birdies. After the number of players getting a birdie increases to a certain point, the lower score becomes the mode and there are no more birdies.

Previously, I had found that a typical distribution of disc golf scores can be approximated by adding 2 to Poisson distribution with a mean of (Average Score minus 2). I used this formula to generate a bunch of scoring distributions for a wide range of average scores. For each scoring distribution, I found the mode, counted the number of scores lower than the mode (what I've been calling Birdies) and the number of scores above the mode (Bogeys). I then plotted the Scoring Spread as a function of the Ratio of Birdies to Bogeys. The results are in the chart below.



This chart refutes the idea that we should design holes for a lot of Birdies in two ways: First, the instability of the ratio. A small change in the average score can change the mode, which changes what "Birdie" and "Bogie" mean for that hole, which drastically

changes the ratio. Second, except for the points of discontinuity, the Scoring Spread is always increased by *decreasing* the number of Birdies (which in this case, is equivalent to increasing the average score).

Conclusions:

The lower third of players climb up through the rankings primarily by avoiding getting higher scores than the field. Everyone gets a few low scores, but those birdies don't make much difference in the final standings.

The top third of players climb through the rankings by both avoiding high scores, and getting low scores. There are enough low scores to affect the standings. However, avoiding high scores is still more important.

So, there is truth to the statement that Birdies are more important for sorting out top players than they are to sorting out the rest of the field.

However, the effect of high scores is stronger than the effect of low scores throughout the field, even for the top third.

(A possible exception is the very top ranked one or two players who appear to use low scores to break away from the rest of the field.)

However, it does not follow that designers should try to design most holes to have a high ratio of birdies to bogeys – even if the designer's only goal is to separate top players.

Holes that have a lot of birdies do not sort out top players (or the rest of the field) as well as holes with a lot of bogeys.

For a typical scoring distribution and average score, Scoring Spread as a function of the ratio of Birdies to Bogeys is maximized at the lower ratios of Birdies to Bogeys.

There is a need for some holes where players can advance by getting a lower score than the field. But, even for the top third of players, it is more important that players risk getting a higher score than the field.

Since the Scoring Spread of a hole will widen as the number of scores below the mode increases (just as it widens as the number of scores above the mode increases) designing holes for a wide Scoring Spread will generate a sufficient amount of scores below the mode anyway, without unduly biasing holes away from generating opportunities for high scores.