

## Fine-tuning a Method for Setting Par

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Re: the method of setting par by using the lowest score for which each throw by a 1000-rated player has a specified chance of being part of a score of par or better.

So far, the method has been performing well; producing pars that are - for the most part - like the pars of the best-run tournaments and like the "real expectations" as described by commentators.

One possible improvement is to work better for certain holes for it seems that par should be lower. A couple of examples: Holes with a very short length for the suggested par, and holes for which a thoughtfully set event par was lower than suggested by the method.

The poster holes for this are the 418-foot par 4 hole #17 at Idlewild, and the 1050-foot par 5 hole #12 at Northwood. Idlewild #17 is short that it is hard to imagine a 1000-rated player wouldn't be expected to get a score of three with errorless play. Northwood #12 is labeled a par 5 by a TD who knows his stuff.

Possible Solutions.

- ☛ Use the method as is. If there aren't enough players getting a lower score, take that as evidence that the lower score cannot be expected, or that playing for the lower score would be a bad strategy. Or, if neither of those are the case, leave it up to the TD to find the anomalous cases.
- ☛ Set a threshold of throws per foot. Like a counterpart to Close Range Par maximum ranges, there could be a minimum distance an expert should be expected to throw, no matter what obstacles are in the way.
- ☛ Invent an inverse method which systematically eliminates high scores as potential pars until it gets down to a par which can be proven to be not too high. I haven't thought of a way to do this, and I think it would need some sort of tie-breaker if the never-too-high par came out lower than the never-too-low par.
- ☛ Lower the cutoff for the percent of throws that are good enough to contribute to getting par. This would widen the net to capture the lower par for holes where not many players are executing errorless play. It would also tilt the balance under/over par slightly toward more over par scores.

Which Fix to Pursue?

- ☛ TD judgement will always be a part of any method to set par, so it's not a bad idea to leave the edge cases to the TDs. This has the advantage of leaving par at the level of maximal information value to which the formula was optimized. However, it is fun to try to shave off any remaining offending corners of the method.
- ☛ A threshold of throws per foot is tempting. As a "red flag" to indicate the par should be looked at closer, this could work. Two problems with using it to adjust par: Remarkably, the hole distance is not always available, and sometimes not accurate. Also, there could be designs that thwart the possibility of laying up for any set minimum distance.

- ¶ I haven't thought of a way to create an inverse method. I think it would need some sort of tie-breaker if the never-too-high par came out lower than the never-too-low par.
- ¶ Revisiting the cutoff percentage seems to be worth a look.

It is clear that pars have often been set to be too high. The average hole score in my database of holes (going back to 2014) was 0.20 throws lower than the tournament par. That doesn't make sense in the face of the definition.

Using my method of looking at the distribution of scores of 1000-rated players to determine par, a cutoff percentage anywhere in the range of 70% to 80% results in fairly well-behaved pars. The current 76.7% figure was set to meet the goal that the frequency of scores below par should be equal to the frequency of scores above par.

Now, I am questioning whether that was the right goal. The two cases noted above raise some suspicion. Also troubling is the tendency for the 76.7% cutoff to generate course pars that would be rated lower than 1000; especially for easier courses. Scores based on errorless throws should only rarely be higher than the average scores.

But more the point, the stated goal (% over = % under) was not derived directly from the definition, but was based on a desired result. The cutoff was set to maximize the information content of par. However, there is nothing in the definition which guarantees par will result in the most information content.

A more definition-derived goal can be lifted from the words "the score that an expert disc golfer would be expected to make". If par is really the expected score from errorless play, and if the majority of throws by experts are errorless, then par should be very common. There is a cutoff where the frequency of par is maximized across all 5,690 holes for which I have enough data. A cutoff of 70.96% maximizes the frequency of par at 56.75%.

I noticed that this cutoff is very close to the square root of one-half. Using this as the cutoff results in 56.74% of scores being par - very nearly maximal and much easier to remember.

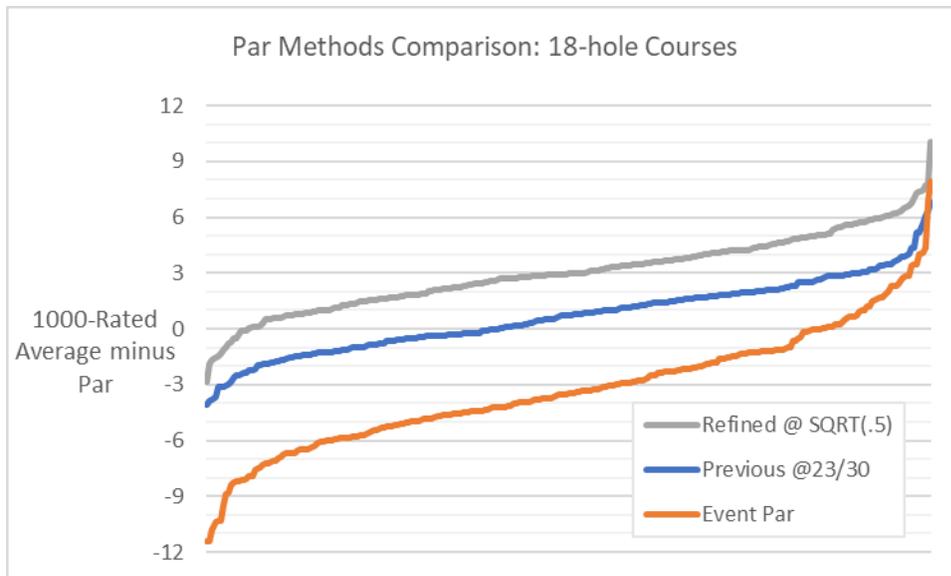
Note that the cutoff of square root of one-half (70.7%) means that if more than half the scores on a hole are two or lower, then par is 2. Which makes sense intuitively. If anyone asks why is par 2 and not 3, the easy answer is "Because there were more twos than threes".

This cutoff value also means that if more than one-fourth of the scores are four or lower, then par is 4. So it's got that going for it. Which is nice.

## **Results and Implications**

The new value does result in a lower suggested par for both Northwood #12 and Idlewild #17. So it resolves that issue.

Here is how the average score for 1000-rated players compares to the pars as set by the TDs (Event Par), as generated by the previous cutoff value of 76.7% (Previous 23/30), and as generated by the proposed value of 70.71% (Refined @ SQRT(.5)). These are sorted separately by the par from each method.



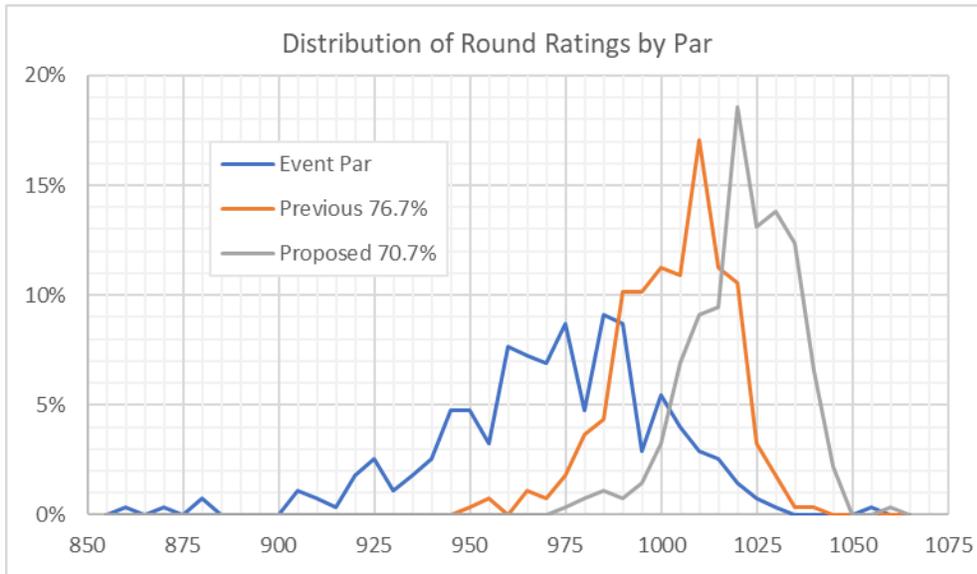
The new value lowers par by about two throws per 18 hole course. This would result in the most common round rating for par being about 1020 instead of about 1010.

The resulting higher round ratings for scores equal to par should please some of the leading thinkers in the sport, including some of the top pros, who think that the basis for par should be more like 1020-rated. I suspect they are thinking of the average scores of 1020-rated players, so using this stricter method of getting at errorless play of 1000-rated players fits with those thinkers' instincts.

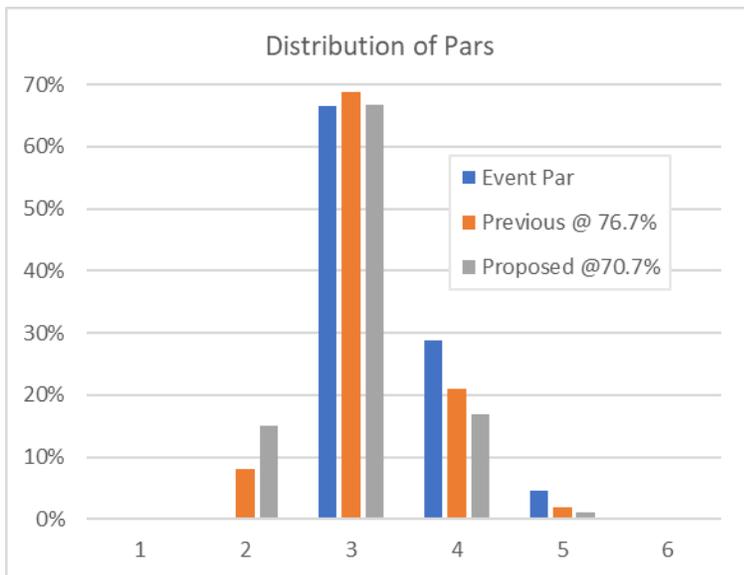
A secondary benefit is that the round ratings for par would be less widely distributed. For the 275 18-hole courses for which I have data:

- ♣ The standard deviation of round ratings for the event pars was 28 points. The minimum round rating for par would have been just 859(!) and the maximum 1025.
- ♣ With the current cutoff percentage of 76.7%, the standard deviation shrinks to 15 points. The minimum round rating for par would have been 950 and the maximum 1038.
- ♣ Using the proposed cutoff of 70.7% would tighten it up more, with a standard deviation of just 13 points. The minimum round rating for par would have been 950 and the maximum 1038.

(Note that both of the maximum round ratings for par under my method come from the 2015 Eureka Temp Course, which had ridiculous amounts of OB penalties. For Event par it was 2016 GBO Emporia Country Club.)



Following is a chart showing the percentage of holes which would be assigned a certain par under each method.



Under any method, most holes will be par 3. Using 1000-rated player as the basis for par will reduce number of holes with higher pars. More so for the new method.

Following is a chart of how a 1000-rated player would score relative to par if they played all 5,690 holes several times.



I was somewhat surprised to see how much of a change the new cutoff makes; another 13% of holes would get lower par. However, it is not as drastic as moving from Event par to the current method, which lowered par on 22% of the holes.

Using the new cutoff actually moves par back down to the original Event par on 30 holes, for these lengths and pars: 217 3, 228 3, 315 3, 339 3, 352 3, 354 3, 360 3, 361 3, 365 3, 375 3, 383 3, 396 3, 398 3, 409 3, 410 3, 420 3, 420 3, 425 3, 459 3, 472 3, 528 3, 613 3, 624 4, 672 4, 716 4, 719 4, 830 3, 888 4, 1050 5, 1050 5.

The 397 holes for which par would be lowered to 2 average a length of 286 feet.

The 290 holes for which par would be lowered to 3 average a length of 572 feet.

The 49 holes for which par would be lowered to 4 average a length of 909 feet.