

Putts Gained

Measuring Putting on the PGA TOUR

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Who was the best putter on the PGA TOUR last year? Does taking 32 putts necessarily represent a poor putting round for a PGA TOUR pro? Current putting stats don't provide convincing answers to these questions. This note gives a brief introduction to *putts gained*, a better way to measure putting skill and rank putters on the PGA TOUR.

Deficiencies of current putting stats

Currently the main stat used to measure putting skill is putts per round, a simple count of the number of putts a golfer takes in an 18-hole round. Putts per round is not a pure measure of putting skill because it doesn't take into account putt distances. A golfer who misses a green and then chips to tap-in range takes fewer putts than a golfer who hits the green and two-putts from sixty feet. The smaller number of putts is due to a superior short-game shot, not superior putting. Putts per green in regulation suffers a similar drawback, because it doesn't account for putt distances: golfers who hit more greens in regulation tend to be putting from longer distances. The length of holed putts, another common putting stat, changes dramatically when a long putt is holed, but a single lucky putt may not be representative of putting skill over an entire round. These deficiencies highlight the need for a better measure of pure putting skill, one that accounts for the distances of putts faced by a golfer during a round.

Putts gained: a better measure of putting skill

Putts gained measures the number of putts better or worse than the field from a given distance:

$$\text{Putts gained} = \text{PGA TOUR average putts to holeout} - \text{Actual putts to holeout}$$

Putts gained for each hole are added to give a golfer's putts gained for the round.

For example, suppose a golfer lands on the green 33 feet from the hole and then sinks the putt. For PGA TOUR golfers, the average number of putts to holeout from 33 feet is 2.0, so the one-putt represents a gain of one stroke (2.0 average putts minus 1 actual putt). A two-putt from 33 feet corresponds to zero putts gained, since the actual number of putts matches the PGA TOUR average from that distance. A three-putt corresponds to a putts gained of minus one (2.0 average putts minus 3 actual putts), i.e., a loss of one stroke.

In most cases the putts gained or lost on a hole will be fraction of a stroke. For example, suppose a golfer lands on the green eight feet from the hole and then sinks the putt. For PGA TOUR golfers, the average number of putts to holeout from eight feet is 1.5. The putts gained equation gives:

$$\text{Putts gained} = 1.5 - 1.0 = 0.5,$$

so the one-putt represents a gain of a half-stroke. A two-putt from eight feet represents a loss of a half-stroke.

Putts gained is a simple, intuitive and pure measure of putting skill. By taking into account the initial distance of each putt, putts gained does not suffer from the deficiencies of putts per round or putts per green in regulation. The putts gained stat is made possible thanks to the PGA TOUR's ShotLink™ data collection system, which measures the location of putts to an accuracy of one inch. Putts gained doesn't penalize a golfer for an approach shot that stops sixty feet from the hole nor does it reward a golfer for a chip to tap-in range. Sinking longer putts gains more relative to the field than sinking shorter putts. Conversely, a three-putt from six feet costs more than a three-putt from fifty feet.

Putts gained examples

To understand how putts gained works, let's examine the putting round of Angel Cabrera on September 4, 2010 when he played in the Deutsche Bank Championship at the TPC

Table 1. Putting results for Angel Cabrera on September 4, 2010 playing in the Deutsche Bank Championship at the TPC Boston course. He took 26 putts for the round, but a putting strokes gained of -2.8 indicates a worse than average putting performance. Putt distances are rounded to the nearest foot and putts gained are rounded to the nearest tenth for clarity.

Hole	1	2	3	4	5	6	7	8	9	Out	
Distance	12	11	5	3	0	2	9	22	4	7.6	
Avg putts	1.7	1.7	1.2	1.0	0.0	1.0	1.6	1.9	1.1	11.2	
Putts	1	2	2	1	0	1	2	3	1	13	
Putts gained	0.7	-0.3	-0.8	0.0	0.0	0.0	-0.4	-1.1	0.1	-1.8	
Hole	10	11	12	13	14	15	16	17	18	In	Total
Distance	1	7	20	0	45	14	11	4	2	11.6	9.6
Avg putts	1.0	1.4	1.9	0.0	2.1	1.8	1.7	1.1	1.0	12.0	23.2
Putts	1	2	3	0	2	2	1	1	1	13	26
Putts gained	0.0	-0.6	-1.1	0.0	0.1	-0.2	0.7	0.1	0.0	-1.0	-2.8

Boston course. Table 1 shows that Cabrera took 26 putts in the round. Most casual observers would call this a very good putting round, since he took three fewer putts than the PGA TOUR average of 29 putts per round. Putts gained tells the opposite story: he lost 2.8 strokes to the field due to his worse than average putting. What explains the contradiction? Cabrera had two zero-putt greens, on holes 5 and 13, which doesn't reflect good or bad putting, but does lower his putts per round. Cabrera missed a 5-footer on hole 3 and a 7-footer on hole 11. Even worse was a three-putt on hole 8 from 22 feet and then another three-putt on hole 12 from 20 feet. In this round his putts started an average of 9.6 feet from the hole, much closer to the hole than the PGA TOUR average of 17 feet. Given Cabrera's initial putt distances, the PGA TOUR average number of putts for the round is 23.2. Yet Cabrera took 26 putts, or 2.8 more than the PGA TOUR average which takes into account the initial putt distances. By looking more closely we see that his putting performance didn't represent one of his better efforts. The putts gained approach isn't fooled by the zero-putt greens or the shorter initial putt distances: it correctly shows that he had a worse than average putting round.

The total loss of 2.8 putts on the round comes from the putts gained or lost on each hole. On the first hole, Cabrera sunk a 12-foot putt. From this distance, the PGA TOUR

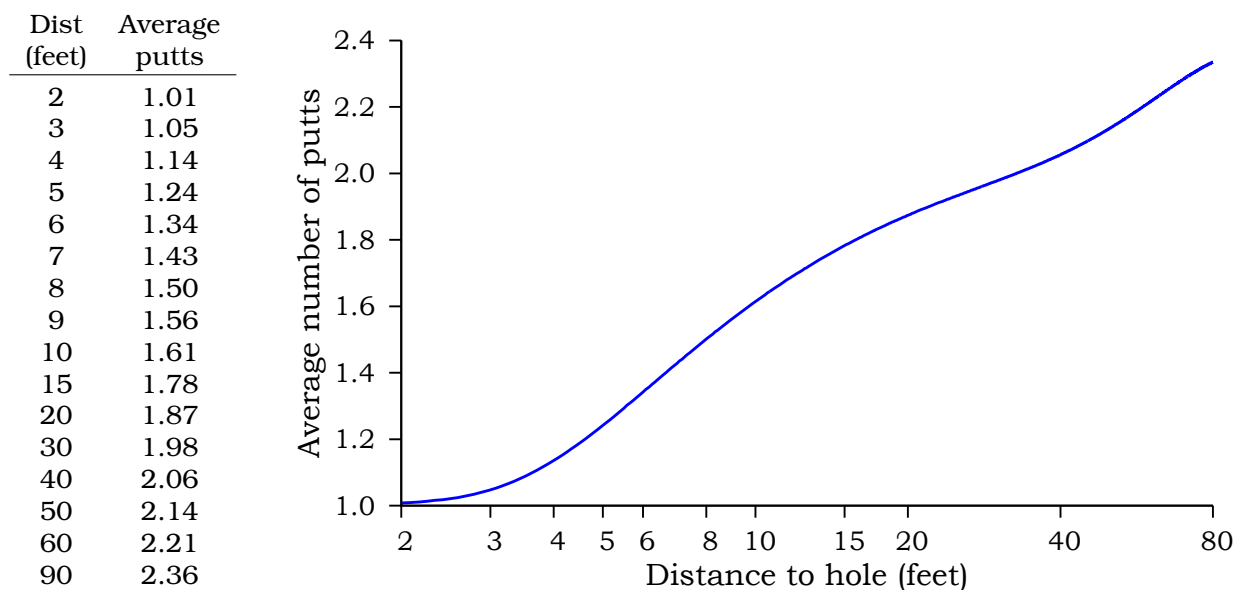


Figure 1. Average number of putts to holeout for PGA TOUR golfers by distance from the hole. The horizontal axis of the chart is in log-scale.

average number of putts is about 1.7 (see Figure 1). Cabrera's one-putt represented a gain of 0.7 putts compared to the PGA TOUR average. This was the longest putt he sunk during the round and the hole with the largest putts gained. On the second hole, Cabrera two-putted from 11 feet. From this distance, the PGA TOUR average number of putts is also about 1.7, so his two-putt represented a loss of 0.3 putts compared to the PGA TOUR average. For the first two holes combined, he gained 0.4 putts compared to the PGA TOUR average. This process is repeated for every hole, and Table 1 shows that he lost 1.8 putts on the first nine holes and 1.0 putts on the second nine, for a total loss of 2.8 putts for the round relative to the PGA TOUR average.

Putts per round can be misleading in the opposite direction as well. Playing one day earlier in the same Deutsche Bank Championship, Ian Poulter took 32 putts for the round, or three putts more than the PGA TOUR average of 29 putts per round. Putts gained analysis showed that he gained 2.3 putts relative to the PGA TOUR average, so his putting performance was, in fact, better than average. Table 2 shows that Poulter's average initial putt distance was a whopping 32 feet, far greater than the PGA TOUR average of 17 feet. Poulter faced putts of forty feet or more on holes 3, 5, 6, 10, 12,

Table 2. Putting results for Ian Poulter on September 3, 2010 playing in the Deutsche Bank Championship at the TPC Boston course. He took 32 putts for the round, but a putting strokes gained of +2.3 indicates a better than average putting performance. Putt distances are rounded to the nearest foot and putts gained are rounded to the nearest tenth for clarity.

Hole	1	2	3	4	5	6	7	8	9	Out	
Distance	14	5	48	15	65	67	8	6	21	27.7	
Avg putts	1.8	1.2	2.1	1.8	2.3	2.3	1.5	1.3	1.9	16.2	
Putts	2	1	2	2	2	2	1	1	2	15	
Putts gained	-0.2	0.2	0.1	-0.2	0.3	0.3	0.5	0.3	-0.1	1.2	
Hole	10	11	12	13	14	15	16	17	18	In	Total
Distance	46	11	90	24	45	45	28	24	20	37.0	32.3
Avg putts	2.1	1.7	2.4	1.9	2.1	2.1	2.0	1.9	1.9	18.1	34.3
Putts	2	1	2	2	2	2	2	2	2	17	32
Putts gained	0.1	0.7	0.4	-0.1	0.1	0.1	0.0	-0.1	-0.1	1.1	2.3

14 and 15. Although he didn't sink any of these putts, he didn't have any three-putts either, and each of his two-putts contributed gains relative to the field. For example, on hole 12 his first putt started 90 feet from the hole. His two-putt on this green gained 0.4 putts relative to the PGA TOUR average of 2.4 putts from this distance. In addition to having no three-putts in the round, Poulter had four one-putts from distances ranging from 5 to 11 feet on holes 2, 7, 8 and 11. By taking initial putt distances into account, the 2.3 putts gained shows that Ian Poulter had a better than average putting round, in spite of taking 32 total putts.

In these two examples, putt distances were rounded to the nearest foot and putts gained were rounded to the nearest tenth for clarity. However, in the PGA TOUR's putts gained computation, putt distances are measured in inches. The PGA TOUR average putting benchmark (illustrated in Figure 1) is computed in one inch increments each year using the nearly half million putts in the ShotLinkTM database from the prior year on the PGA TOUR.

As these two examples illustrate, taking 32 putts per round doesn't necessarily indicate a poor putting day, nor does 26 putts necessarily indicate of a good day on the greens. There are many cases, though, where putts gained, putts per round, and even

putts per green in regulation give similar results. But unlike putts per round and putts per green in regulation, the putts gained stat works well even when golfers have zero-putt greens or their putts start closer or further from the hole than average. Putts gained is an intuitive, pure and useful measure of putting skill which directly gives the number of putts that a golfer gained on the field in a round.

Adjusted putts gained

In order to account for differences in putting difficulty from one course to another, and from one round to another, putts gained per round are adjusted by the average putts gained of the field for that round. For example, suppose the average putts gained of the field was -0.15 for a particular round, indicating that the entire field putted worse than the PGA TOUR average, possibly because the greens were bumpy or the greens had more undulation than average. For each golfer, putts gained per round is increased by 0.15 in order to account for the difficulty of the greens that day. The ranking of putters does not change for the round, since all putts gained are adjusted by the same amount. However, when comparing golfers during a season across different courses and rounds, this adjustment to strokes gained ensures that golfers will not be penalized for playing in a round when putting was slightly more difficult than average. This is exactly the same adjustment that is made when the PGA TOUR computes the adjusted scoring average stat, which is used to determine the winner of the Byron Nelson Award for best scoring during the year. (For more information on adjusted scoring average, see, e.g., <http://www.pgatour.com/r/stats/info/xm.html?120>.) For simplicity, the PGA TOUR refers to adjusted putts gained simply as putts gained.

Ranking putting on the PGA TOUR

Golfers can now be ranked on a pure measure of putting skill by averaging (adjusted) putts gained across rounds. Sample results for the 2010 season are shown in Tables 3 and 4. The best putter in 2010, Luke Donald, gained almost 0.9 putts on the field per round. By contrast, Billy Mayfair was the worst putter with at least 25 rounds of play in 2010, and he lost just over one putt per round to the field. (No wonder he had to make

a trip to Q-school in December.) Nearly two putts per round separate the best and worst putters on the PGA TOUR.

Putts gained history and development

The strokes gained approach to measuring and analyzing off-green and on-green golf performance has been used in the Golfmetrics software since 2005. Strokes gained results for amateur and professional data was published in Broadie (2008), where the term shot value was used instead of strokes gained. Putts gained analysis, with a novel adjustment procedure, was used in Fearing et al. (2010) to rank putters on the PGA TOUR. The strokes gained approach was used to rank on-green and off-green performance on the PGA TOUR using data since 2003 in Broadie (2010). Early research on putting appears in Cochran and Stobbs (1968), Soley (1977) and Riccio (1990).

Table 3. Top 20 PGA tour golfers in 2010 ranked by putts gained. Putting ranks are out of the 211 PGA tour golfers with at least 25 rounds during 2010.

Rank	Golfer	Putts Gained	Rank	Golfer	Putts Gained
1	Donald, Luke	0.863	11	Wi, Charlie	0.565
2	Casey, Paul	0.813	12	Imada, Ryuji	0.554
3	Pettersson, Carl	0.813	13	Sim, Michael	0.520
4	Wilson, Dean	0.779	14	Jones, Matt	0.511
5	Chalmers, Greg	0.773	15	McCarron, Scott	0.503
6	Gay, Brian	0.729	16	Merritt, Troy	0.503
7	Goosen, Retief	0.674	17	Baddeley, Aaron	0.503
8	Kuchar, Matt	0.638	18	Na, Kevin	0.488
9	Collins, Chad	0.625	19	Molder, Bryce	0.475
10	Johnson, Zach	0.579	20	Snedeker, Brandt	0.464

Table 4. Notable PGA TOUR golfers. Putting ranks are out of the 211 PGA tour golfers with at least 25 rounds during 2010.

Rank	Golfer	Putts Gained
21	Westwood, Lee	0.458
25	Stricker, Steve	0.435
31	Furyk, Jim	0.402
43	Els, Ernie	0.330
53	Toms, David	0.263
54	Harrington, Pdraig	0.260
68	Poulter, Ian	0.211
78	Fowler, Rickie	0.150
85	Duval, David	0.117
86	Johnson, Dustin	0.113
98	Choi, K.J.	0.054
114	Weir, Mike	-0.018
116	Woods, Tiger	-0.034
119	Appleby, Stuart	-0.053
130	O'Hair, Sean	-0.088
144	Mickelson, Phil	-0.148
145	Cabrera, Angel	-0.150
155	Sabbatini, Rory	-0.200
174	Garcia, Sergio	-0.368
191	Mediate, Rocco	-0.550
204	Singh, Vijay	-0.738
205	Scott, Adam	-0.743
211	Mayfair, Billy	-1.014

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