Calculating the Probability of Round Scores for a Given Rating

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A method of calculating round scores is presented which is not dependent on the assumption of a normal distribution of scores.

Summary of Method

1. The scoring distribution of individual holes is computed for the player rating of interest.
2. Hole scores are randomly selected from those distribution and added up to get round scores.
3. This simulation is repeated until the results are reliable and the results tabulated.

Reasons

The distribution of rounds scores is likely not normally distributed, because it is not symmetrical. Very low scores are harder to get than very high scores. This is a result of the asymmetry of the distribution of scores for each hole. A hole that has a median score of 3 is far more likely to generate some 5s than some 1s.

Case Study

I looked at calculating the probability that Paul McBeth would get a 45 on the Toboggan course at the 2018 Great Lakes Open.

Using hole-by-hole-by-player scores, I computed the following scoring distributions for a 1044-rated player. The method is the same as I have described for calculating scoring distributions for 1000-rated players for determining par.

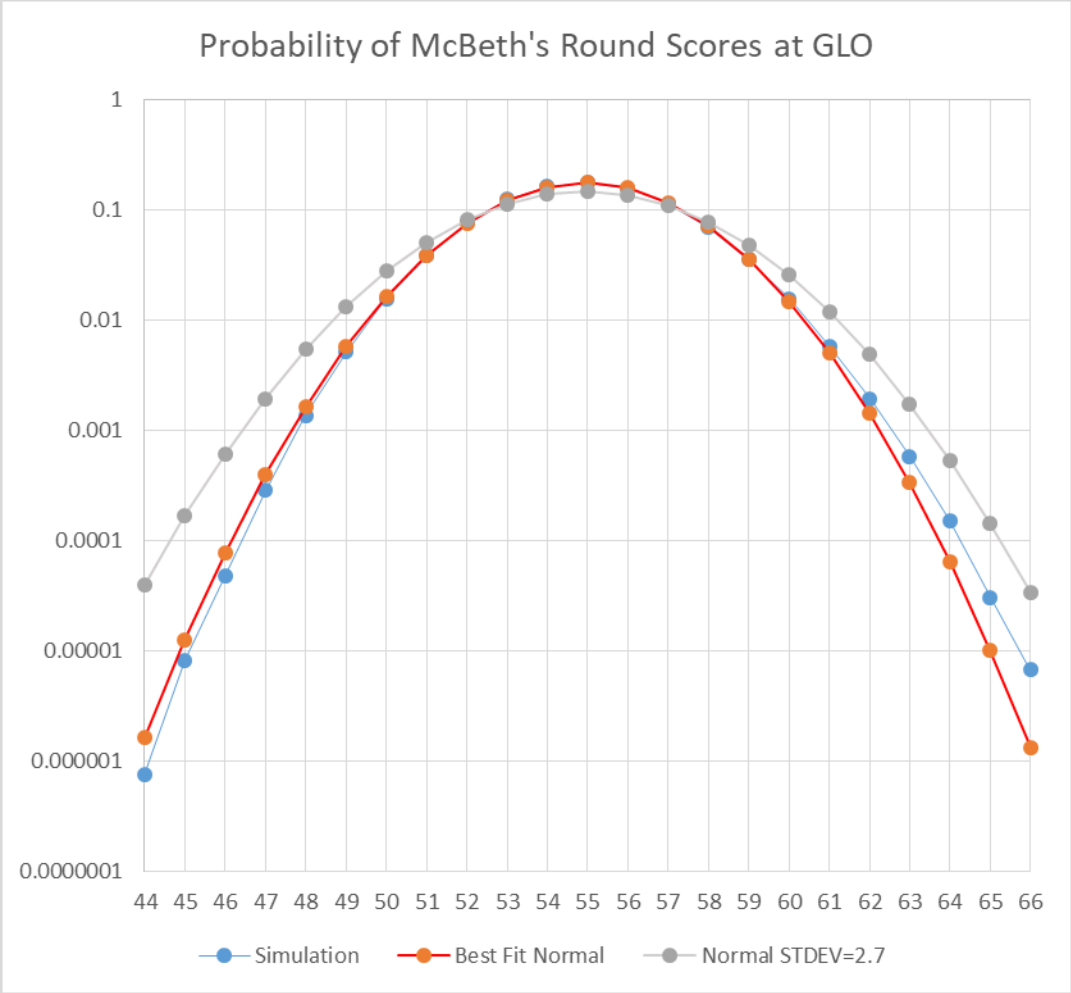
Hole #	1	2	3	4	5	6	7	8	9
Feet	477	726	915	580	300	632	483	462	452
Average	2.84	4.06	3.65	3.46	2.82	3.49	3.10	2.53	2.82
1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.1%
2	18.7%	0.2%	1.0%	2.0%	27.9%	1.9%	4.6%	47.6%	18.1%
3	78.5%	15.0%	38.7%	57.7%	62.4%	47.6%	81.2%	51.1%	81.6%
4	2.8%	69.0%	54.6%	32.3%	9.4%	50.5%	14.1%	0.9%	0.2%
5	0.0%	12.7%	5.7%	8.0%	0.3%	0.0%	0.0%	0.0%	0.0%
6	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
7	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
8	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
9	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Hole #	10	11	12	13	14	15	16	17	18
Feet	370	358	534	700	375	567	354	755	315
Average	2.75	2.66	3.03	3.44	2.50	3.16	2.65	3.20	2.79
1	0.1%	0.2%	0.0%	0.0%	0.5%	0.0%	0.1%	0.0%	0.1%
2	31.0%	34.5%	7.6%	2.1%	49.1%	4.0%	38.7%	3.9%	25.6%
3	64.7%	64.4%	81.4%	52.2%	49.9%	77.9%	56.9%	72.1%	69.5%
4	2.5%	0.9%	11.0%	44.9%	0.5%	16.3%	4.2%	24.0%	4.9%
5	1.7%	0.0%	0.0%	0.7%	0.0%	1.7%	0.0%	0.0%	0.0%
6	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
7	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
8	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
9	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

The resulting distribution of round scores was as follows.

Score	Probability	1/Pr
44	0.00007%	1,346,006
45	0.00082%	122,364
46	0.0047%	21,141
47	0.0285%	3,514
48	0.137%	731
49	0.512%	195
50	1.56%	63.9
51	3.85%	25.9
52	7.69%	13.0
53	12.43%	8.05
54	16.32%	6.13
55	17.65%	5.67
56	15.55%	6.43
57	11.35%	8.81
58	6.94%	14.4
59	3.55%	28.1
60	1.56%	64.2
61	0.583%	172
62	0.193%	517
63	0.0581%	1,722
64	0.0152%	6,566
65	0.00302%	33,098
66	0.00067%	149,544
67	0.00012%	807,754
68	0.00010%	1,010,101
69	0.00002%	4,032,258

The best fit normal distribution to this is mean of 54.95 and standard deviation of 2.27.

The following chart shows the above distribution, the best fir normal and a normal distribution with a standard deviation of 2.7.


Probability of McBeth's Round Scores at GLO
1
0.1
0.01
0.001
0.0001
0.00001
0.000001
0.0000001
44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66
Simulation
Best Fit Normal
Normal STDEV=2.7