

## **The FedEx Cup for Golf and Numbers Lovers**

**by Dwight Grant**

### **Wednesday Evening**

The FedEx Cup final tournament starts tomorrow. Much has been written about the changes in the rules determining the winner this year. First, there will be a single winner, rather than an East Lake tournament winner and a Cup winner. Second, while players are still ranked going into East Lake by points accumulated through the year, their ranks translate to initial stroke scores before anyone tees off. Justin Thomas, the points leader receives the number one ranking and a beginning score of -10, 10 below par. Patrick Cantlay, number 2 in points, receives an initial score of -8. Table 1A shows the players' starting positions as of Wednesday evening. For convenience, we also listed the prize money in Table 1B.

One topic that does not seem to have been addressed is how this seeding is likely affect the outcome of the FedEx Cup. For example, by how much does Justin Thomas's starting score of -10 increase his probability of winning the FedEx Cup? We examined that question in a Monte Carlo simulation. To implement the simulation, we have to make assumptions about the relative quality of the players going into the tournament. In many respects, this is the \$64 question. Like most such questions, there is no easy answer. One way to think about incorporating relative quality in the simulation is to review the player's history of scores and use that information to handicap each player in the simulation. There is ample evidence that over the course of the year some of the players have, on average, scored better than others. For example, this year Dustin Johnson has averaged 69.693 strokes per round as compared to Patrick Reed who has averaged 70.207. In the elite world of top professional golfers, this is a wide margin in favor of Johnson. But, to use a cliché, Reed is rounding into form at just the right time, while the same does not appear to be true of Johnson. While not denying others ability to effectively read the golfers' recent results, course preferences, and other factors determining their performance, we opted to treat all 30 of the players as being of equal ability. This is also consistent with our primary interest, namely, how is the stroke seeding likely to affect the FedEx Cup results. The other input for our model is the type of distribution of scores we assume and its dispersion. We selected a normal distribution for the scores and, after examining the data, a standard deviation of 5.25 for a 4-round total score. We assumed that the score for each round is independent so this translates into a per round standard deviation of 2.625 strokes.

As with simulations of many events, some of the results produced are obvious and most make intuitive sense, but would have been difficult to quantify in advance. For example, if we assume all of the golfers are of equal skill, Justin Thomas, who starts at -10 has the best chance of winning. At the other end of the spectrum, the 5 players who start at the highest initial score, 0, are not very likely to win. Based on our model, as of Wednesday evening Thomas's starting score increased his probability of winning the Cup from 3.33% (1 in 30) to 24%. The probability of winning if you start with a score 0 decreases from 3.33% to 0.6%. Table 2 summarizes the results of the simulation and also reports the expected prize money for each starting position. On that point, commentators observed that qualifying for the tournament guaranteed a play at least \$395,000 in prized money. True, that is the minimum prize. What is the expected value of the earnings for the last qualifiers? Our model indicates it is \$789,000, almost twice as large a payoff.

Table 1A	
Player	Wednesday Evening Score
J. Thomas	-10
P. Cantlay	-8
B. Koepka	-7
P. Reed	-6
R. McIlroy	-5
A. Ancer	-4
J. Rahm	-4
M. Kuchar	-4
W. Simpson	-4
X. Schauffele	-4
A. Scott	-3
D. Johnson	-3
G. Woodland	-3
H. Matsuyama	-3
T. Finau	-3
B. Snedeker	-2
J. Rose	-2
K. Kisner	-2
P. Casey	-2
R. Fowler	-2
C. Connors	-1
C. Reavie	-1
M. Leishman	-1
S.J. Im	-1
T. Fleetwood	-1
B. DeChambeau	0
C. Howell III	0
J. Kokrak	0
L. Glover	0
L. Oosthuizen	0

Table 1B	
Final Finish	Prize Money (millions)
1	\$15.000
2	\$5.000
3	\$4.000
4	\$3.000
5	\$2.500
6	\$1.900
7	\$1.300
8	\$1.100
9	\$0.950
10	\$0.830
11	\$0.750
12	\$0.705
13	\$0.660
14	\$0.620
15	\$0.595
16	\$0.570
17	\$0.550
18	\$0.535
19	\$0.520
20	\$0.505
21	\$0.490
22	\$0.478
23	\$0.466
24	\$0.456
25	\$0.445
26	\$0.435
27	\$0.425
28	\$0.415
29	\$0.405
30	\$0.395

**Table 2**  
Probability of Final Tournament Finish as of Wednesday Evening & Expected Value of Finish Position and Earnings

Starting Score	<u>1</u>	<u>2-5</u>	<u>6 - 10</u>	<u>11 - 15</u>	<u>16 - 20</u>	<u>21 - 25</u>	<u>26 - 30</u>	Expected Value of Finish	Expected Earnings (millions)
-10	24.0%	37.9%	19.8%	9.8%	5.1%	2.5%	8.4%	5.9	\$5.46
-8	13.4%	33.8%	22.7%	14.1%	8.9%	5.0%	2.2%	8.1	\$3.76
-7	9.7%	29.5%	23.8%	16.0%	10.8%	6.9%	3.3%	9.4	\$3.08
-6	6.9%	25.3%	23.4%	17.6%	13.2%	8.7%	4.9%	10.7	\$2.51
-5	4.8%	20.6%	22.6%	18.6%	15.0%	11.3%	7.1%	12.2	\$2.04
-4	3.3%	16.6%	20.6%	18.9%	16.5%	14.2%	10.0%	13.7	\$1.66
-3	2.2%	12.7%	18.3%	18.5%	18.0%	16.7%	13.7%	15.2	\$1.35
-2	1.4%	9.5%	15.6%	17.5%	18.6%	19.0%	18.4%	16.8	\$1.11
-1	0.9%	6.9%	12.9%	15.9%	18.6%	20.9%	23.9%	18.3	\$0.93
0	0.6%	4.9%	10.2%	14.0%	17.6%	22.4%	30.3%	19.7	\$0.79

### Thursday Evening

Table 3 updates Table 2 to reflect the results of the first round. After Thursday's round Schauffele, Koepka and Thomas shared the lead at 10 under. They got there by different routes. Schauffele shot the best round of the day, 6 under while Koepka was 3 under and Thomas shot par, three-quarters of a stroke worse than the field average. His beginning score of ten under was certainly an attractive cushion, but no one thought it would protect him from below average

**Table 3**  
Probability of Final Tournament Finish as of Thursday Evening & Expected Value of Finish Position and Earnings

Starting Score	1	2-5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	Expected Value of Finish	Expected Earnings (millions)
-10	16.1%	39.6%	24.7%	11.9%	5.2%	2.0%	0.5%	6.8	\$3.50
-9	11.2%	35.6%	27.1%	15.0%	7.2%	3.1%	0.9%	7.8	\$2.78
-8	7.6%	30.3%	28.2%	17.7%	10.0%	4.7%	1.4%	8.9	\$2.21
-7	5.0%	24.7%	27.8%	20.1%	13.1%	6.9%	2.3%	10.2	\$1.75
-6	3.2%	19.4%	26.4%	21.7%	15.9%	9.6%	3.8%	11.5	\$1.40
-5	2.1%	14.4%	23.6%	22.8%	18.3%	12.7%	6.0%	12.8	\$1.11
-4	1.2%	10.5%	20.0%	22.4%	20.6%	16.3%	9.0%	14.2	\$0.91
-3	0.7%	7.3%	16.3%	21.0%	22.2%	19.5%	13.1%	15.8	\$0.76
-2	0.4%	4.8%	12.8%	18.7%	22.2%	22.7%	18.4%	17.3	\$0.65
-1	0.2%	3.1%	9.6%	15.9%	21.3%	25.2%	24.7%	18.9	\$0.58
0	0.1%	2.0%	6.7%	12.9%	19.5%	26.5%	32.3%	20.5	\$0.52
1	0.1%	1.2%	4.7%	9.9%	17.0%	26.5%	40.7%	21.6	\$0.45
3	0.0%	0.4%	2.0%	5.2%	11.4%	22.6%	58.5%	24.0	\$0.40

golf. Table 3 indicates that the three leaders each now has a 16% of winning the Cup and a 56% chance of a top 5 finish. Just behind them at 9 under, McElroy has an 11% chance of winning and a 47% chance of a top 5 finish. At the other end of the scoring, Glover shot 3 over to end the day at that score. His probability of winning went from miniscule, 0.6% to less than 0.001%. As the tournament started his expected finish was 19.7 and his expected earnings were \$790,000. After Thursday's round his expected finish increases to 24.0 and his expected earnings declined to \$400,000. (To see players scores, changing probabilities of winning and expected finish at the beginning of each round refer to Table 6 at the end of the article.)

## Friday Evening

Table 4 updates Table 3 to reflect the scores on Friday. Revie had the round of the day at 6 under, and this moved him from even par to 6 under. His chance of winning is still low at 1%, but his expected finish improved from 20.5 to 10.4 and his expected earnings increased from \$520,00 to \$1,140,000. Friday's scores shuffled the top of the leaderboard slightly with Koepka alone at -13, McElroy and Thomas at -12 and Schauffele at -11. Collectively, those 4 players have an 87% of winning the Cup, Koepka is at 30.6%, McElroy and Thomas are each at 21.4% and Schauffele is at 14.2%. Casey at -9 has a 5.7% chance of winning and Cantlay at -2 has a 2% chance. All the other players have less than a 1% chance of winning and the bottom half of the field has a cumulative probability of winning of 0.36%.

Table 4  
Probability of Final Tournament Finish as of Friday Evening & Expected Value of  
Finish Position and Earnings

Starting Score	1	2-5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	Expected Value of Finish	Expected Earnings (millions)
-13	30.6%	54.6%	12.6%	1.9%	0.3%	0.0%	0.0%	3.8	\$5.69
-12	21.4%	56.9%	17.7%	3.3%	0.7%	0.1%	0.0%	4.5	\$4.57
-11	14.2%	55.2%	23.8%	5.2%	1.3%	0.3%	0.0%	6.1	\$2.90
-9	5.7%	42.3%	34.9%	12.2%	3.8%	1.0%	0.1%	7.6	\$1.79
-7	2.0%	25.1%	38.9%	21.0%	9.4%	3.2%	0.5%	9.3	\$1.42
-6	1.0%	17.9%	36.6%	24.8%	13.1%	5.5%	1.1%	10.4	\$1.14
-5	0.5%	12.1%	31.9%	27.4%	17.2%	8.7%	2.1%	11.7	\$0.92
-4	0.2%	7.6%	26.0%	28.5%	21.2%	12.6%	3.8%	13.0	\$0.76
-3	0.1%	4.6%	20.0%	26.9%	24.5%	17.3%	6.6%	14.5	\$0.65
-2	0.1%	2.6%	14.3%	23.7%	26.3%	22.4%	10.8%	16.2	\$0.57
-1	0.0%	1.4%	9.7%	19.4%	25.9%	26.9%	16.6%	18.0	\$0.52
0	0.0%	0.7%	6.1%	15.2%	23.6%	30.2%	24.2%	19.7	\$0.49
1	0.0%	0.4%	3.7%	10.8%	20.1%	31.7%	33.3%	21.4	\$0.47
2	0.0%	0.1%	2.2%	7.0%	16.4%	30.3%	43.9%	23.0	\$0.45
3	0.0%	0.1%	1.1%	4.6%	12.0%	27.2%	55.0%	24.0	\$0.42
8	0.0%	0.0%	0.0%	0.2%	1.1%	5.7%	93.0%	28.8	\$0.41

## Sunday Morning

Table 5 updates Table 4 to reflect the third-round scores recorded on Saturday and Sunday morning. Koepka, McElroy and Schauffele continued to play well at at the end of the round Koepka led the other two by a stroke, -15 to -14. Thomas an Casey had the next best scores at -11.

That difference makes a large difference in the model in terms of win probability. Koepka's win probability is 41%, while McElroy and Schauffele each have a probability of 25%. As an example of the effect of the seeding system, Thomas and Casey each have a win probability of just under 4% despite Casey having been 8 strokes better than Thomas at East Lake.

Table 5  
Probability of Final Tournament Finish as of Sunday Morning & Expected Value of Finish Position and Earnings

Starting Score	1	2-5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	Expected Value of Finish	Expected Earnings (millions)
-15	41.1%	57.7%	1.2%	0.0%	0.0%	0.0%	0.0%	2.1	\$8.63
-14	25.4%	71.9%	2.6%	0.0%	0.0%	0.0%	0.0%	2.6	\$6.76
-11	3.9%	75.7%	19.3%	0.9%	0.1%	0.0%	0.0%	4.4	\$3.38
-6	0.0%	10.2%	57.3%	23.5%	7.4%	1.5%	0.1%	9.5	\$1.22
-5	0.0%	5.1%	47.6%	30.6%	12.8%	3.7%	0.3%	11.1	\$1.01
-4	0.0%	2.4%	34.8%	34.8%	20.0%	7.3%	0.7%	12.8	\$0.84
-3	0.0%	1.0%	22.8%	33.9%	27.1%	13.3%	1.8%	14.7	\$0.72
-2	0.0%	0.4%	13.2%	28.8%	31.7%	21.6%	4.3%	16.7	\$0.63
-1	0.0%	0.1%	7.0%	21.0%	32.1%	30.9%	8.9%	18.6	\$0.57
0	0.0%	0.0%	3.2%	13.6%	28.1%	38.7%	16.4%	20.5	\$0.52
1	0.0%	0.0%	1.4%	7.8%	21.2%	42.0%	27.7%	22.3	\$0.49
2	0.0%	0.0%	0.5%	3.9%	14.0%	39.3%	42.3%	23.8	\$0.47
5	0.0%	0.0%	0.0%	0.2%	2.0%	14.2%	83.6%	27.2	\$0.42
7	0.0%	0.0%	0.0%	0.0%	0.3%	4.0%	95.7%	28.6	\$0.41
9	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	99.2%	29.4	\$0.40

### Sunday Evening

There was an ebb and flow to today's round but the top four finishers included 4 or the top 5 going into the round. McElroy observed that his objective starting the tournament was to shoot the best score over the 4-day tournament. Under the old system, that would have been enough for him to win the Cup because he started 5<sup>th</sup> in the rankings, and the top 5 players controlled their own destiny in the sense that if they won East Lake, they won the FedEx too. In the event, Revie shot the low score at East Lake and McElroy tied for 2<sup>nd</sup>. Whether he would have won the Cup with Thomas and Koepka finishing 7<sup>th</sup> and 8<sup>th</sup>, is a question that the simplified system eliminates.

Table 6  
FedEx Cup 2019

Player	<u>Wednesday Eve</u>			<u>Thursday Eve</u>			<u>Friday Eve</u>			<u>Sunday Morn</u>			<u>Sunday Eve</u>	
	Score	Probability of Winning	Expected Finish	Score	Probability of Winning	Expected Finish	Score	Probability of Winning	Expected Finish	Score	Probability of Winning	Expected Finish	Final Score	Final Finish
J. Thomas	-10	24.0%	5.9	-10	16.1%	6.8	-12	21.4%	4.5	-11	3.9%	4.4	-13	3.5
P. Cantlay	-8	13.4%	8.1	-8	7.6%	8.9	-7	2.0%	9.3	-2	0.0%	16.7	1	22.0
B. Koepka	-7	9.7%	9.4	-10	16.1%	6.8	-13	30.6%	3.8	-15	41.1%	2.1	-13	3.5
P. Reed	-6	6.9%	10.7	-6	3.2%	11.5	-6	1.0%	10.4	-3	0.0%	14.7	-5	10.0
R. McIlroy	-5	4.8%	12.2	-9	11.2%	7.8	-12	21.4%	4.5	-14	25.4%	2.6	-18	1.0
A. Ancer	-4	3.3%	13.7	-2	0.4%	17.3	-3	0.1%	14.5	-1	0.0%	18.6	1	22.0
J. Rahm	-4	3.3%	13.7	-6	3.2%	11.5	-4	0.2%	13.0	-6	0.0%	9.5	-4	12.5
M. Kuchar	-4	3.3%	13.7	-8	7.6%	8.9	-6	1.0%	10.4	-5	0.0%	11.1	-1	17.0
W. Simpson	-4	3.3%	13.7	0	0.1%	20.5	0	0.0%	19.7	-2	0.0%	16.7	-1	17.0
X. Schauffele	-4	3.3%	13.7	-10	16.1%	6.8	-11	14.2%	6.1	-14	25.4%	2.6	-14	2.0
A. Scott	-3	2.2%	15.2	-5	2.1%	12.8	-5	0.5%	11.7	-4	0.0%	12.8	-8	6.0
D. Johnson	-3	2.2%	15.2	0	0.1%	20.5	2	0.0%	23.0	9	0.0%	29.4	10	29.5
G. Woodland	-3	2.2%	15.2	-5	2.1%	12.8	-2	0.1%	16.2	-3	0.0%	14.7	-2	15.0
H. Matsuyama	-3	2.2%	15.2	-7	5.0%	10.2	-2	0.1%	16.2	-6	0.0%	9.5	-5	10.0
T. Finau	-3	2.2%	15.2	-3	0.7%	15.8	-4	0.2%	13.0	-4	0.0%	12.8	-7	7.0
B. Snedeker	-2	1.4%	16.8	1	0.1%	21.6	3	0.0%	24.0	0	0.0%	20.5	2	24.5
J. Rose	-2	1.4%	16.8	-4	1.2%	14.2	0	0.0%	19.7	1	0.0%	22.3	3	26.5
K. Kisner	-2	1.4%	16.8	-1	0.2%	18.9	-1	0.0%	18.0	-3	0.0%	14.7	-5	10.0
P. Casey	-2	1.4%	16.8	-6	3.2%	11.5	-9	5.7%	7.6	-11	3.9%	4.4	-9	5.0
R. Fowler	-2	1.4%	16.8	-1	0.2%	18.9	0	0.0%	19.7	0	0.0%	20.5	0	19.5
C. Connors	-1	0.9%	18.3	-3	0.7%	15.8	-2	0.1%	16.2	-1	0.0%	18.6	3	26.5
C. Reavie	-1	0.9%	18.3	0	0.1%	20.5	-6	1.0%	10.4	-6	0.0%	9.5	-6	8.0
M. Leishman	-1	0.9%	18.3	0	0.1%	20.5	3	0.0%	24.0	5	0.0%	27.2	2	24.5
S.J. Im	-1	0.9%	18.3	-4	1.2%	14.2	-3	0.1%	14.5	0	0.0%	20.5	0	19.5
T. Fleetwood	-1	0.9%	18.3	-2	0.4%	17.3	-2	0.1%	16.2	-1	0.0%	18.6	-1	17.0
B. DeChambeau	0	0.6%	19.7	-2	0.4%	17.3	-1	0.0%	18.0	-4	0.0%	12.8	-4	12.5
C. Howell III	0	0.6%	19.7	-2	0.4%	17.3	1	0.0%	21.4	2	0.0%	23.8	4	28.0
J. Kokrak	0	0.6%	19.7	1	0.1%	21.6	-2	0.1%	16.2	0	0.0%	20.5	-3	14.0
L. Glover	0	0.6%	19.7	3	0.0%	24.0	8	0.0%	28.8	7	0.0%	28.6	10	29.5
L. Oosthuizen	0	0.6%	19.7	0	0.1%	20.5	1	0.0%	21.4	2	0.0%	23.8	1	22.0