

Golf Handicapping Analysis

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INTRODUCTION

The 18 holes of a golf course are each assigned a handicap that has both a technical meaning and a perception of difficulty. From a technical standpoint, handicap refers to the difference between strong and poor golfers, and holes are ranked in terms of the difference in average strokes between the groups (with 1 having the largest difference and 18 having the smallest difference). For the purpose of this project, “difficulty” will be a ranking of how many strokes over par the average golfer scores (with 1 being the largest difference from par and 18 being the smallest difference from par). This research project involves three components:

1. Investigating the correlation between the assigned handicap and hole difficulty.
2. Describing the relationship between professional golfer performance and assigned handicap.
3. Determining the factors that predict the handicap for several local golf courses.

DATA

Performance data were collected from consenting recreational golfers at A.J. Jolly, California, and Elks Run golf courses. Scorecards for 19 local courses¹, as well as Professional Golfer’s Association (PGA) tournament data², were obtained electronically. The data include:

- Individual rounds: Hole-by-hole scores for individual local golfers.
- Scorecard data: Par, handicap, and yardage for each hole.
- Professional tournament data: Summary statistics from events between October 2016 and June 2017 on the PGA tour.

METHODS

Minitab® (Version 17.1.0, copyright 2013) was used for analysis. In addition to basic descriptive statistics and graphs, correlation analysis investigates the association between observed handicap and scorecard handicap as well as between hole difficulty (average strokes above par) and scorecard handicap. Analysis of covariance was used to identify significant variables that contributed to the handicap.

RESULTS

The table below illustrates the difference between assigned course handicap for each hole and the hole’s difficulty (as defined earlier). Moderate correlations were found between observed hole difficulty and the assigned handicap for all three golf courses studied.

Course	Variable/Handicap	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
A.J. Jolly	Avg. Strokes over Par	1.08	1.35	0.58	1.08	0.65	0.46	0.77	0.77	0.69	0.77	0.65	0.85	0.77	0.46	0.38	0.27	0.85	0.65
	Rank [$r_s = 0.54$ (0.02)]	T2	1	14	T2	T11	T15	T6	T6	10	T6	T11	T4	T6	T15	17	18	T4	T11
California	Avg. Strokes over Par	1.76	1.37	1.27	1.55	1.56	1.11	1.44	1.17	1.25	1.34	1.24	1.28	1.32	1.49	1.11	1.07	1.06	0.83
	Rank [$r_s = 0.67$ (0.002)]	1	6	10	3	2	T14	5	13	11	7	12	9	8	4	T14	16	17	18
Elks Run	Avg. Strokes over Par	1.33	1.35	1.04	1.43	0.96	1.45	1.02	1.49	0.84	1.22	1.36	1.08	0.98	0.85	0.71	1.13	0.91	0.96
	Rank [$r_s = 0.51$ (0.015)]	6	5	10	3	13	2	11	1	17	7	4	9	12	16	18	8	15	14

* r_s = Spearman Correlation (p-value)

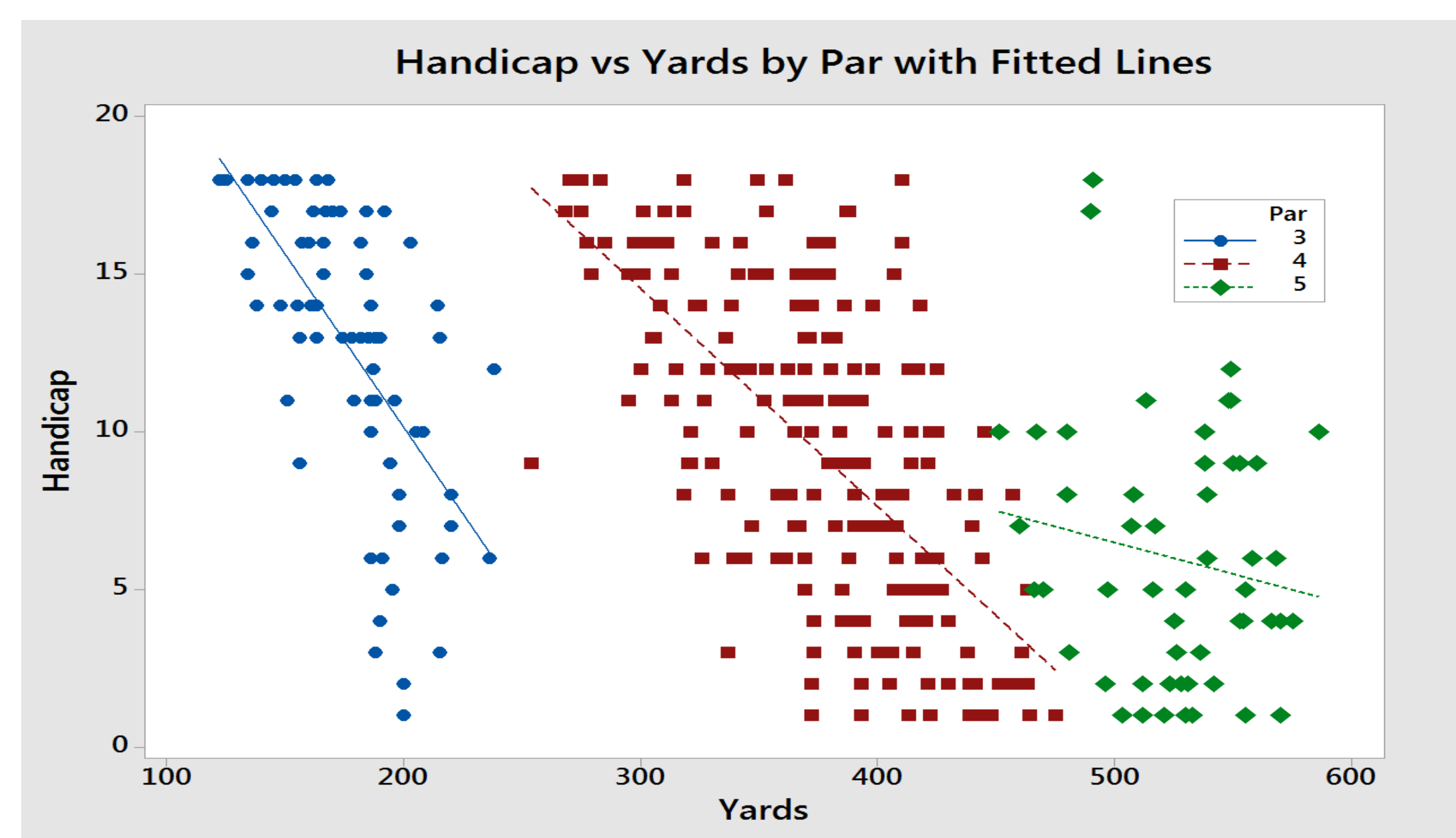
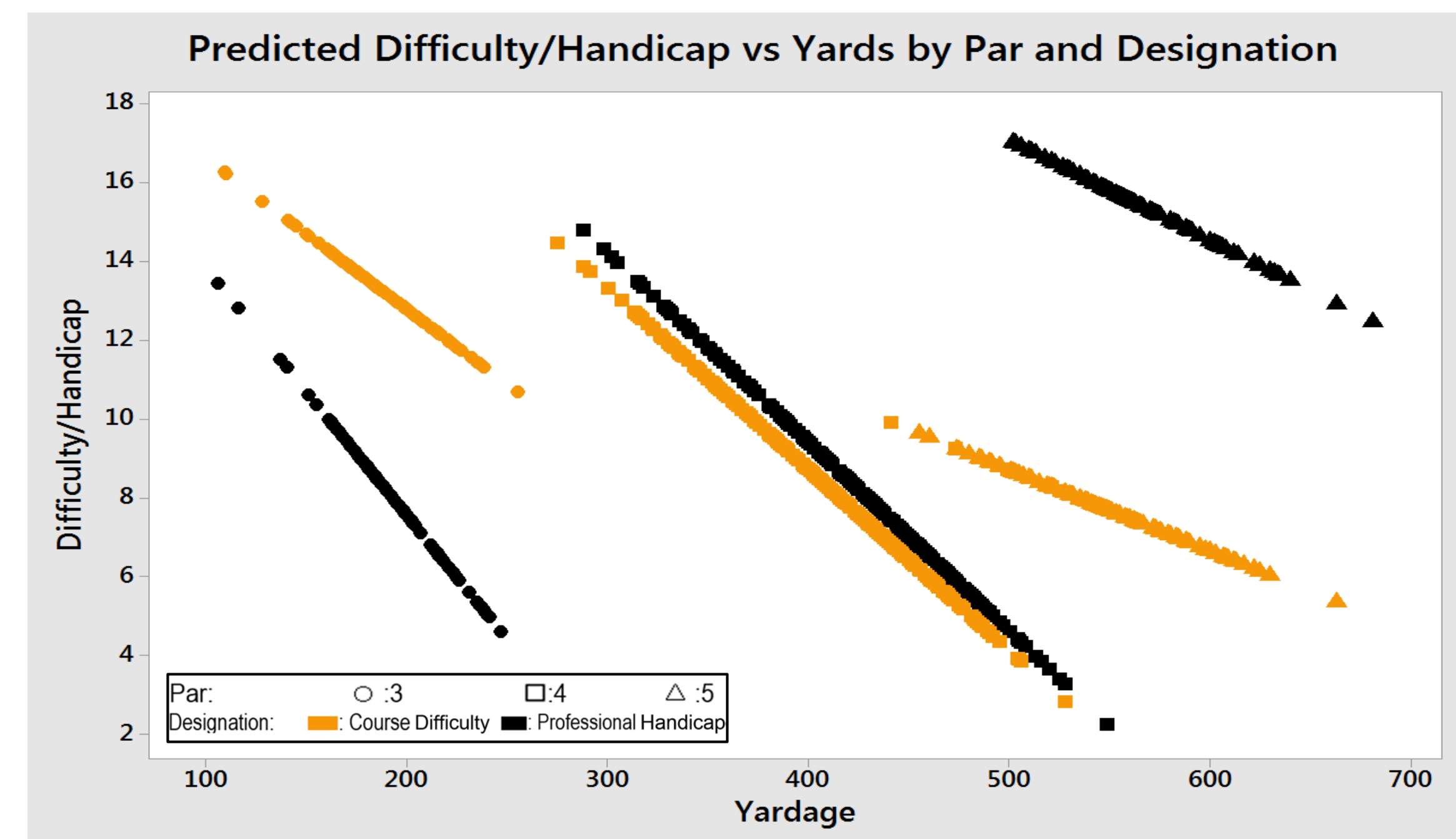
The next table inspects the relationship between course handicap and observed handicap for each hole. Using USGA methodology³, the hole-by-hole differences in average strokes for the best 25% and worst 25% of golfers were ranked to determine “observed handicap”. Moderate correlations also exist between observed handicap and the assigned handicap for two of the three golf courses studied.

Course	Variable/Handicap	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
A.J. Jolly	Average Diff U-L	0.83	0.83	1.00	0.83	0.67	0.33	1.00	2.00	0.33	0.67	0.50	0.67	0.50	0.50	0.33	0.00	0.67	0.50
	Rank [$r_s = 0.43$ (0.037)]	T4	T4	T2	T4	T7	T15	T2	1	T15	T7	T11	T7	T11	T11	T15	18	T7	T11
California	Average Diff U-L	2.60	2.22	1.89	1.85	1.98	1.83	1.58	2.40	2.10	1.26	2.02	1.96	1.96	2.23	1.50	1.82	1.62	1.01
	Rank [$r_s = 0.09$ (0.72)]	1	4	10	11	7	12	15	2	5	17	6	T8	T8	3	16	13	14	18
Elks Run	Average Diff U-L	1.75	1.42	1.52	1.71	1.17	0.68	1.92	1.85	1.60	1.08	1.33	1.25	0.77	1.42	0.81	1.53	1.44	2.57
	Rank [$r_s = 0.48$ (0.022)]	4	T10	8	5	14	18	2	3	6	15	12	13	17	T10	16	7	9	1

* r_s = Spearman Correlation (p-value)

*U-L = difference between a player with an upper handicap (worst 25%) and a player with a lower handicap (best 25%)

Analysis of covariance was applied to investigate the association between the par/yardage for a hole (including interaction) and observed difficulty for professionals. A similar analysis examined the assigned handicap in place of difficulty. The analysis found a significant effect on difficulty due to par and yardage. Further, the data suggested that difficulty rank increases (meaning the hole gets easier) for professionals as par and yardage increases. The opposite was observed for course handicap. As par and yardage increase, the variance between strong and poor golfers becomes greater (i.e. the handicap number goes down).



Analysis of covariance was also implemented to study the relationship of par and yardage (and their interaction) with the assigned handicap for 19 local courses. The figure on the left displays this interaction model. Both yardage and par are associated to handicap. Yardage has a significant effect on handicap for par 3 and par 4 holes (p -values < 0.001), with increasing yardage indicating a lower handicap. There is no evidence yardage has an effect for par 5 holes (p -value = 0.215). Generally, the par 5 holes seem to have lower numbered handicaps regardless of yardage.

CONCLUSIONS

- Based on the three courses with player data, scorecard handicap seems more closely related to hole difficulty than the USGA definition of handicap (as variance) would suggest.
- Par 3 holes are more difficult for professionals than the handicap might suggest. Conversely, par 5 holes are easier for professionals than the handicap would indicate.
- Additional yardage has greater impact on difficulty for par 3 holes, where weaker players only have one stroke to make up the extra distance. On par 5 holes, more strokes are available and the impact of distance is minimal.
- Typically, recreational par 5 holes are assigned lower handicap values regardless of yardage.

FUTURE WORK

Possibilities for further studies include:

- Larger sample sizes at the individual courses.
- Incorporate golfer’s official handicap prior to the round.
- Greater consistency in the set of tees (e.g. blue, white, seniors) used by golfers.
- Investigate the difference between difficulty and handicap by par/yardage.

REFERENCES

- ¹ Retrieved June 23, 2017 from <http://www.oobgolf.com/courses>
- ² Retrieved June 23, 2017 from <http://www.pgatours.com>
- ³ Retrieved June 27, 2017 from <http://www.usga.org/HandicapFAQ>

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