

Do Golf Handicaps Always Level the Playing Field?



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What is golf handicapping?

- Golf handicapping is meant to “level the playing field” and allow players of different abilities to compete nearly equally in tournaments. It’s about fairness and an equal chance to win.
- Each golfer has a handicap based on a fairly elaborate formula that uses the ten best, adjusted scores in the most recent twenty rounds. Details on how to determine a golfer’s handicap are provided in the appendix.
- In competition, the handicap is subtracted from a golfer’s **gross** score to determine the **net** score. The net scores among players within a flight division are then ranked and the lowest net scores are the event winners.

A Brief Introduction to the USGA Handicapping System

Hole	RATINGS	
	(Par 72)	(Par 71)
Gold	74.0/139 (72)	73.0/136 (71)
Blue	72.0/135 (72)	70.9/132 (71)
White	69.9/131 (72)	68.7/128 (71)

Example scorecard and ratings.

Hole	RATINGS		1	2	3	4	5	6	7	8	9	Out	INT	10	11	12	13	14	15	16	17	18	In	Tot	Hcp	Net
Gold	74.0/139 (72)	73.0/136 (71)	452	384	435	495	402	511	171	507	446	3503	446	500	237	410	381	184	521	414	404	380	3497	7000	GB Tee 6768	Rating: 73.0/137
Blue	72.0/135 (72)	70.9/132 (71)	434	357	415	170	389	485	145	486	405	3286	428	482	205	370	364	172	461	392	380	357	3254	6540	B/W Tee 6131	Rating: 69.9/130
White	69.9/131 (72)	68.7/128 (71)	404	332	398	154	367	466	126	469	375	3091	406	456	175	348	330	154	437	335	366	338	3007	6098		
Handicap			5	11	1	13	7	15	17	9	3		6	18	4	10	8	2	16	14	12					
Par			4	4	4	3	4	5	3	5	4	36	4	5	3	4	4	3	5	4	4	3	4/3	36/35	72/71	
Handicap			7	13	5	17	3	1	15	11	9		4	8	16	14	10	18	2	12	6					
Silver	72.9/134 (72)	71.7/132 (71)	382	299	334	118	343	425	126	404	375	2806	389	456	175	308	315	144	430	335	343	338	2895	5701	Combo Tee 5442	
Red	70.5/124 (72)	69.3/121 (71)	358	266	334	98	292	400	108	404	313	2573	366	403	148	301	269	99	405	290	343	325	2624	5197	Women's Combo	Rating: 71.6/127
Scorer:																										

Silver	72.9/134 (72)	71.7/132 (71)
Red	70.5/124 (72)	69.3/121 (71)

* In Maui, HI, Kaanapali course has tees labeled Uliuli, Keo Makamae, and Pu Koko'o.

- A typical golf course will have several different sets of tee-boxes on each hole from which the golfers play their round. The tee-boxes indicate different overall lengths in yards or meters of the course played.
- The tee-boxes are often color labeled*: **Gold** or **Black** for the longest yardages (called the “tips”), **Blue** or **Green** for the popular intermediate yardages, **White** or **Silver** for more forward tees, and **Yellow** or **Red** for the shortest yardages.
- For each set of tees, there will be two important rating numbers such as **74.2/131**. The first number is the course “*par*” rating based on the overall yardage for the 18 holes. The second is the “*slope*”, a measure of the course difficulty from the chosen tees.
- These two numbers are meant to adjust for scores of golfers playing from different courses and tee-boxes.

What Is a Fair Handicapping System?

From a statistical viewpoint, how can we determine that the handicapping system is fair and performing as expected?

Expectation:

Gross scores should increase nearly linearly with handicaps, but **net scores** should be reasonably consistent and comparable across handicaps.

The analysis approach we employ is to compare graphs of the gross and net scores versus handicaps.

Statistical Analysis of Gross and Net Scores

- For golfers competing, there should be a positive, nearly linear, increasing relationship between the golfers' **gross scores** and the current handicap. The **slope** of the regression line should be **statistically significant**, and **RSquare** should be reasonably **high**.
- If the handicap system is fair, there should be **little or no correlation** between the golfers' **net scores** and the current handicaps. The **slope** of the regression line and **RSquare** should **both be near zero**.

Investigating the Relationship Between Gross and Net Scores with JMP

For this talk, we apply JMP's analytical and visualizing capabilities to investigate the relationship between gross and net scores versus handicaps for four different tournaments run at a private country club.

We employ some of JMP's powerful analytical capabilities such as: Fit Y by X, Distributions, Graph Builder, Outlier Screening, and BY variable formula functions.

Discovery with JMP

In the process, we uncover several interesting scoring differences for various tournaments among men, seniors, and women.

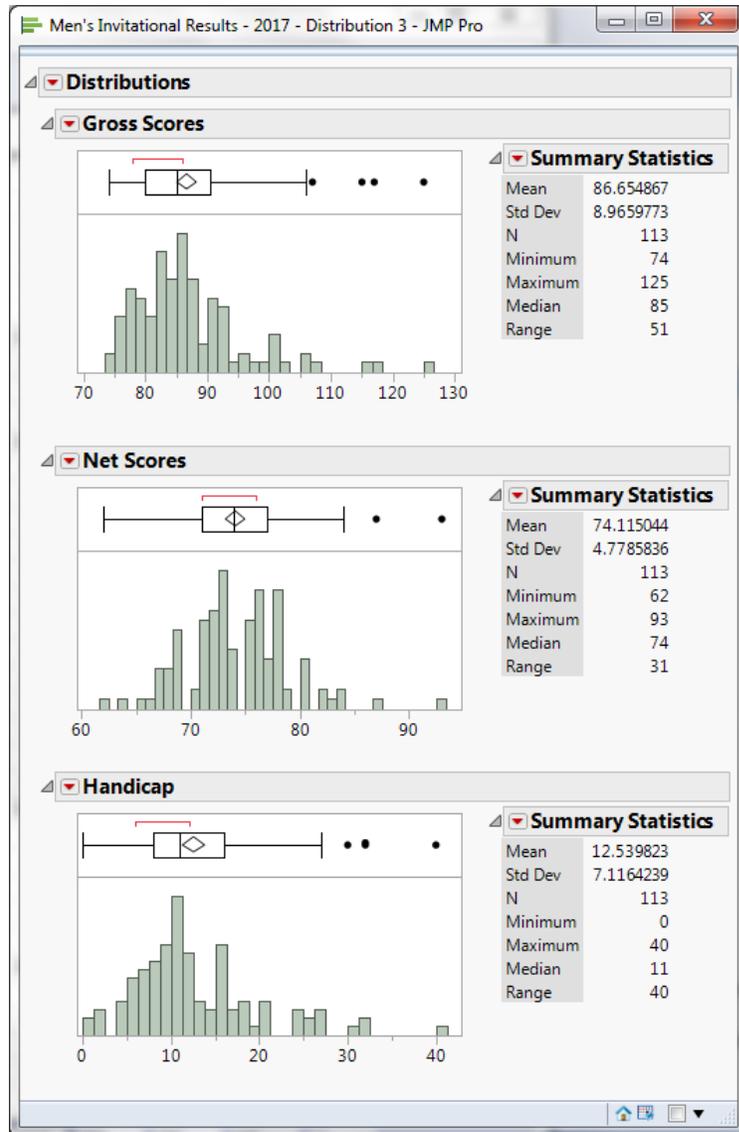
An “Aha!” moment occurs when we discover that the handicapping system for a certain tournament type can result in outcomes not consistent with a level playing field for all competitors.

Discovery with JMP

In addition, we also address some interesting issues:

1. Was there any sandbagging occurring in the tournament?
2. What is the most difficult tournament for women golfers?
3. How many golfers in a tournament “shoot their handicaps”?

SCVCC 2017 Men's Invitational Results



- A total of 113 men played the blues tees (par 71).
- The **Gross Scores** ranged from 74 to 125, with median 85.
- The **Net Scores** ranged from 62 to 93, with median 74.
- The **Handicaps** ranged from 0 to 40, with median 11.

Note how JMP's **Summary Statistics** have been customized to show the minimum, maximum, median, and range.

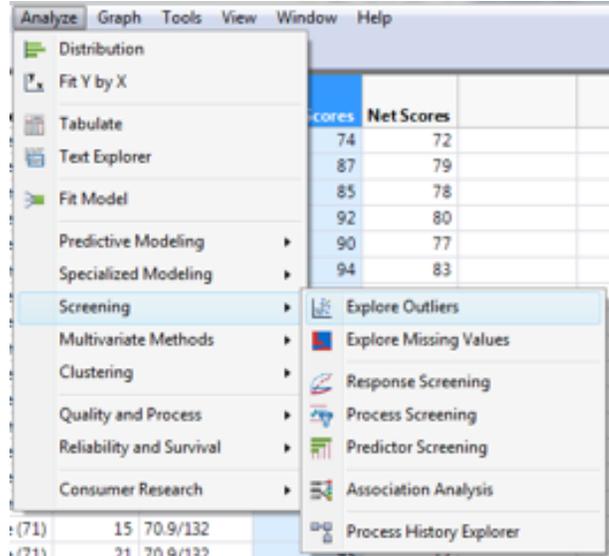
Sandbagging: Outlier Detection

It can be informative to detect exceptionally low outliers in the net scores, especially scores that are posted by what are referred to as “sandbaggers”, individuals who shoot unusually low scores not consistent with their handicaps in competition.

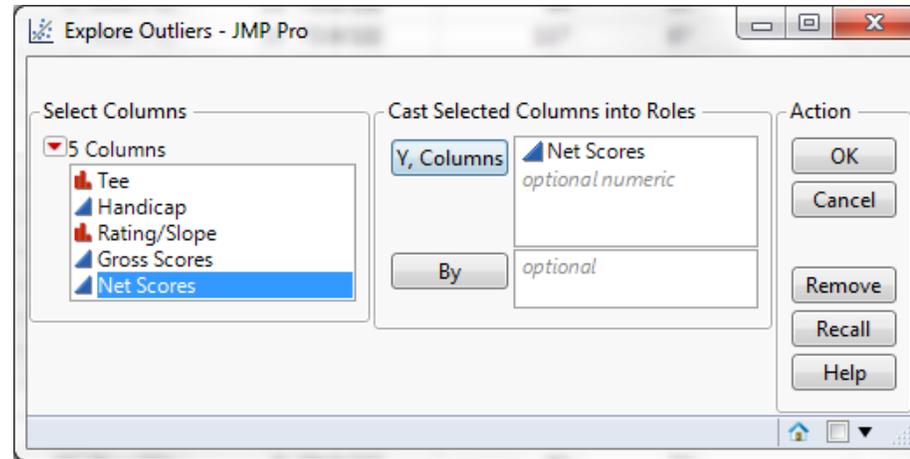


Checking for Outliers in Net Scores with JMP

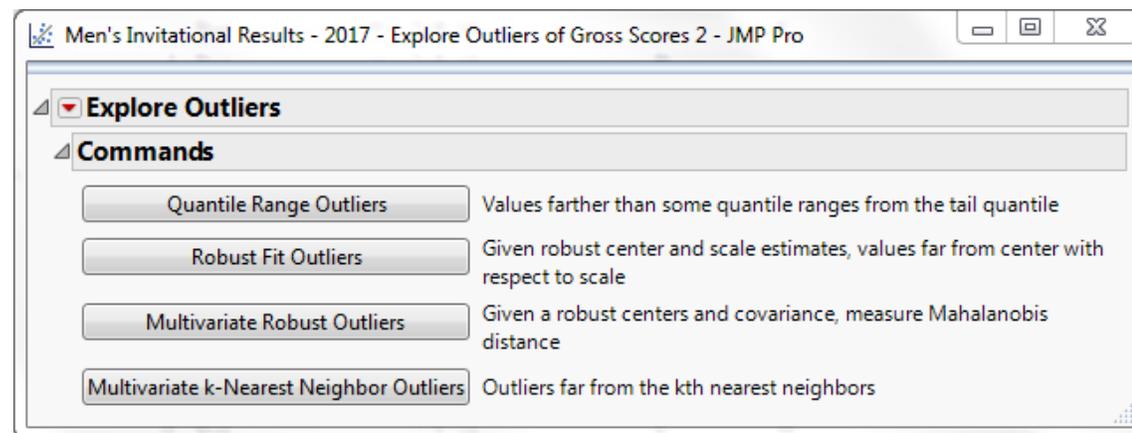
Analyze, Screening, Explore Outliers



Cast Roles



Select Either Quantile Range or Robust Fit Outliers



Checking for Outliers in Net Scores with JMP

Quantile Range showed no outliers. Robust Range identified a possible outlier.

To view outliers, click Net Scores Column and Select Rows to highlight row with suspect outlier.

Quantile Range Outliers

Men's Invitational Results - 2017 - Explore Outliers of Net Scores 2 - ...

Explore Outliers

Commands

Quantile Range Outliers

Outliers are values Q times the interquartile range past the lower and upper quartiles.

Tail Quantile Select columns and choose an action.

Q

Restrict search to integers

Show only columns with outliers

Column	10% Quantile	90% Quantile	Low Threshold	High Threshold	Number of Outliers (Count)
Net Scores	68	80	32	116	0

Robust Fit Outliers

Men's Invitational Results - 2017 - Explore Outliers of Net Scores 2 - JMP Pro

Explore Outliers

Commands

Quantile Range Outliers

Robust Fit Outliers

Outliers are K spreads from the center. Select columns and choose an action.

Huber

Cauchy

Quartile

K

Show only columns with outliers

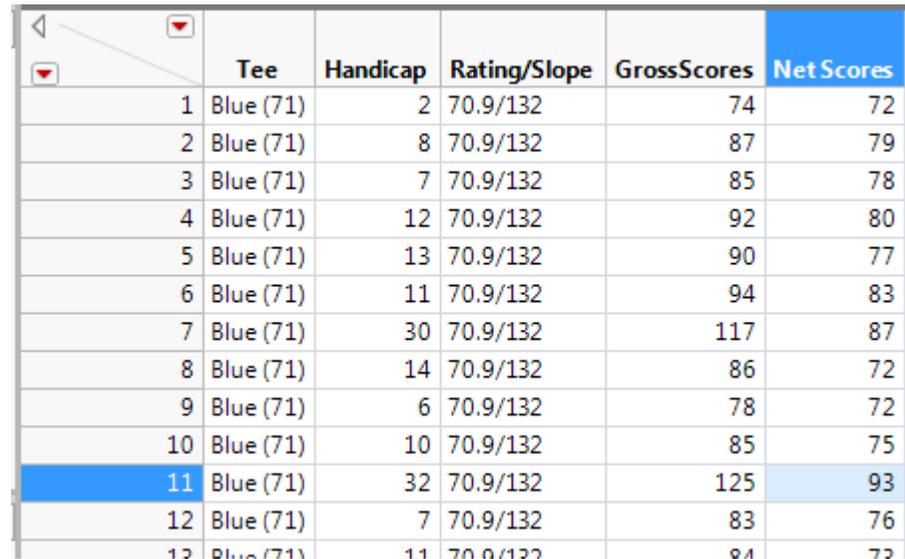
Robust Estimates and Outliers

Column	Huber Center	Huber Spread	Huber N Outliers	Cauchy Center	Cauchy Spread	Cauchy N Outliers	Quantile Center	Quantile Spread	Quantile N Outliers
Net Scores	74.011123	4.5443832	1	73.890652	4.0815439	1	74	4.4478067	1

Outlier Row in Net Scores

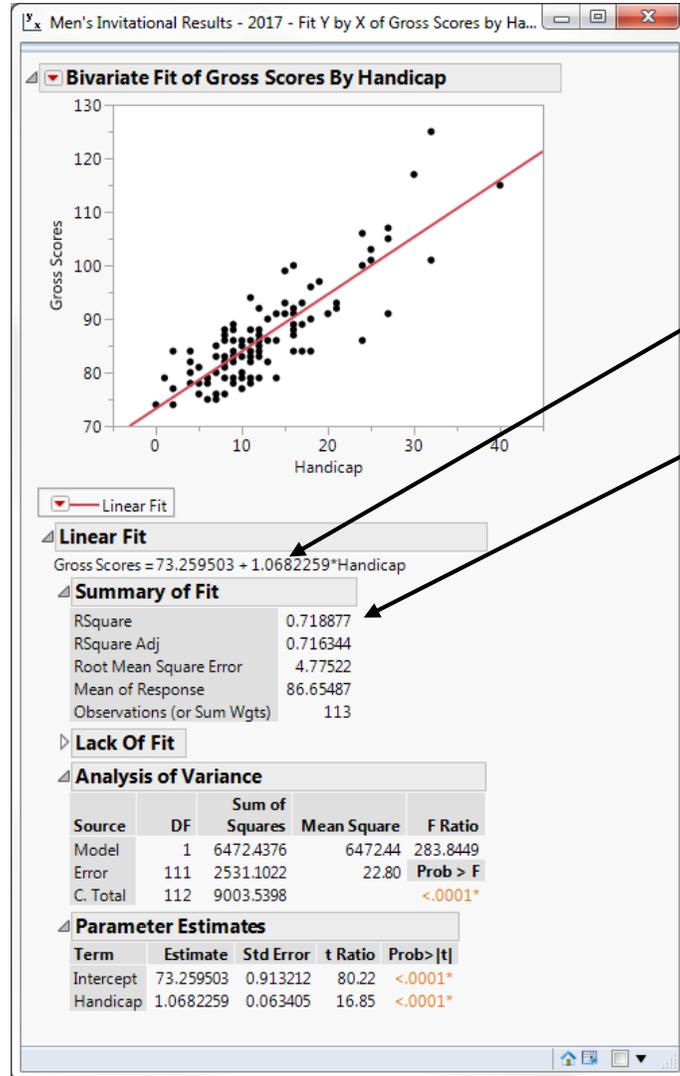
JMP highlighted row 11 with Handicap 32, Gross Score 125, and Net Score 93. This was a **high outlier** and no evidence of sandbagging!

We can choose to Hide and Exclude this outlier by right clicking on the row, but we will include it in the analysis that follows.



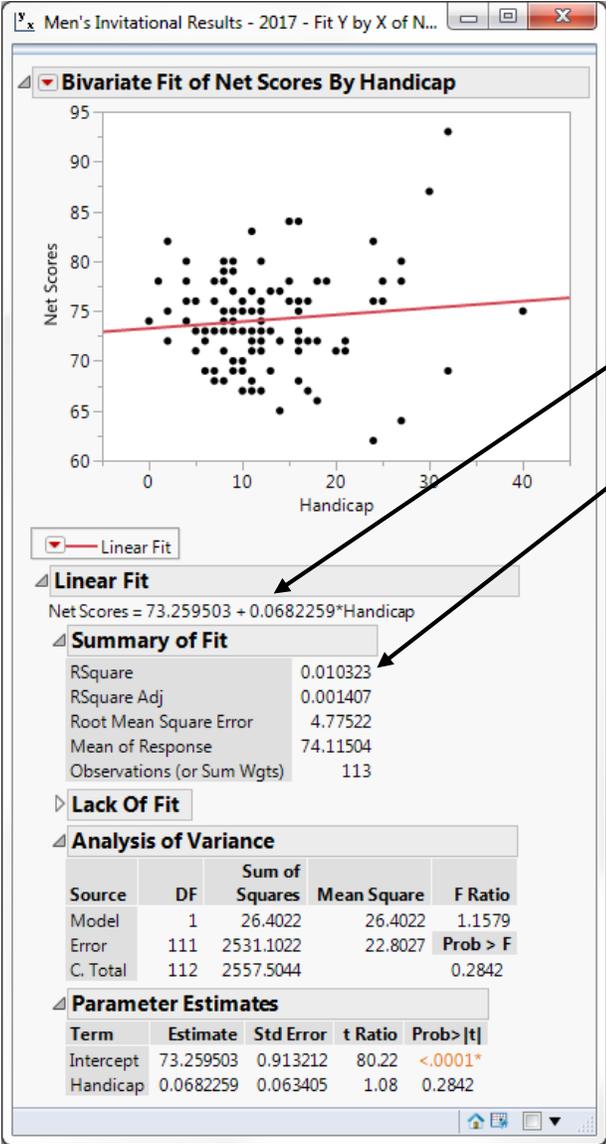
	Tee	Handicap	Rating/Slope	GrossScores	Net Scores
1	Blue (71)	2	70.9/132	74	72
2	Blue (71)	8	70.9/132	87	79
3	Blue (71)	7	70.9/132	85	78
4	Blue (71)	12	70.9/132	92	80
5	Blue (71)	13	70.9/132	90	77
6	Blue (71)	11	70.9/132	94	83
7	Blue (71)	30	70.9/132	117	87
8	Blue (71)	14	70.9/132	86	72
9	Blue (71)	6	70.9/132	78	72
10	Blue (71)	10	70.9/132	85	75
11	Blue (71)	32	70.9/132	125	93
12	Blue (71)	7	70.9/132	83	76
13	Blue (71)	11	70.9/132	94	83

Gross Scores Versus Handicaps (Fit Y by X)



- As expected, there is a statistically significant, linear relationship between the gross scores and the handicaps.
- Slope of the regression line is ~ 1 .
- RSquare is roughly 72%, that is, the handicap factor reduces the variance in the distribution of gross scores by 72%.

Net Scores Versus Handicaps



- There is no statistically significant relationship between the net scores and the handicaps.
- Slope of the regression line is ~ 0.07
- RSquare is only $\sim 1\%$.
- We interpret these results as indicating that the handicap factor produced fairly consistent and comparable scores among the players, that is, there was a **relatively level playing field** for the competing golfers.

Mean Scores by Handicap (Formula byVariable)

- Because of the variation in individual gross and net scores for each handicap value, it can be informative to consider estimating the mean scores for each handicap and then applying Fit Y by X.
- A very useful capability in the formula menu easily allows the mean estimation via the byVariable in the Col Mean function to calculate means based on the entries in a specific column.
- For example, suppose we wish to calculate the gross mean scores by handicap. We set up a separate column labeled “Gross Mean Scores by Handicap” in the data table.

Mean Scores by Handicap (Formula byVariable)

- In the formula entry whiteboard space, select **Statistical**, **Col Mean**, and click on the “Gross Scores” column to get the entry shown below:

Col Mean (Gross Scores)

- Next, with the “Gross Scores” outline box highlighted, click the insert symbol “^” to display the “byVariable” box, and click the “Handicap” column for that entry.

Col Mean (Gross Scores, byVariable) → Col Mean (Gross Scores, Handicap)

- JMP will now fill in the column with the mean gross scores for each handicap.
- Because of the different number of golfers at each handicap value, we can also set up a separate column for weights or frequency for the number of players at each handicap value using formula below.

Col Number (Handicap, Handicap)

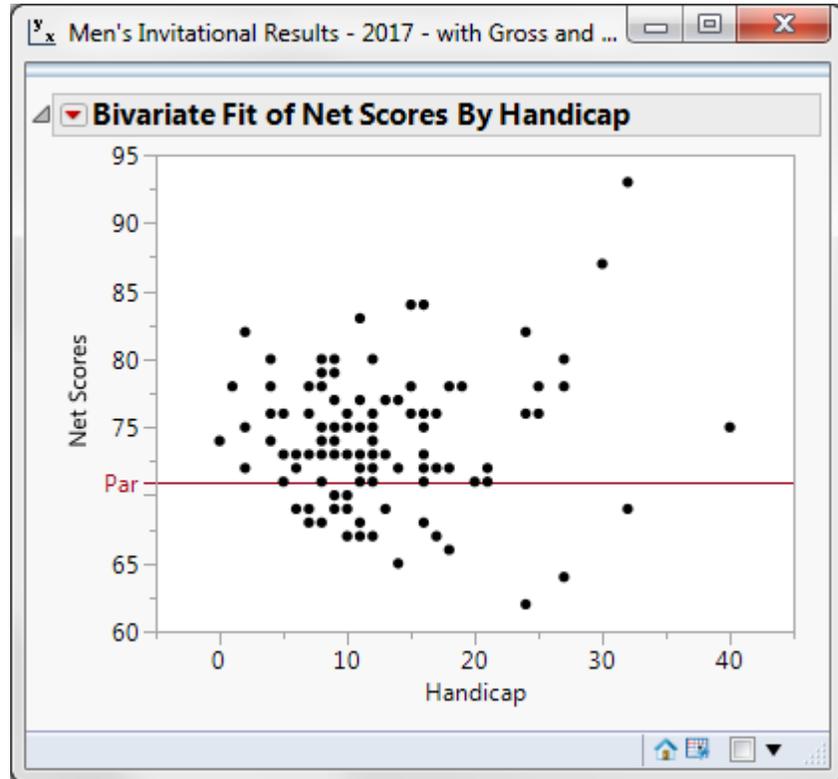
- Note that **multiple** byVariables can be inserted in the formula.

Gross and Net Mean Scores by Handicap



- By using the weighted mean scores by handicap, we have much less variation in the plots.
- The regression line slope for Mean Gross Scores versus handicap is ~ 1.0 .
- The RSquare $\sim 92\%$.
- The regression line slope for Mean Net Scores versus handicap is ~ 0.01 .
- The RSquare is only $\sim 0.2\%$.
- **The expectation of a level playing field is supported.**

“Shooting a Handicap”



- How often does a golfer shoot his/her handicap in a tournament, that is, have net scores of par or better?
- This plot shows that even with a fairly level playing field, it is still challenging for golfers to “shoot their handicap”.
- Only 31 or $31/113 = 27\%$ had net scores of par (71) or better.

Analyses of Three Other Tournaments*

- A similar analyses was done on three other tournaments.

LEADERS										
PK	PLAYER	TODAY	THRU	TOTAL	R1	R2	R3	R4	TOTAL	PTS
1	SPEITH	+1	F	-3	66	74	73		213	16
2	KAUFMAN	-3	F	-2	73	72	69		214	15
T3	LANGER	-2	F	-1	72	73	70		215	14
T3	MATSUYAMA	E	F	-1	71	72	72		215	14
T4	REY	-1	E	E	71	71	73		215	14

- 2018 Men’s Stroke Play Championship (two rounds) with 74 golfers
- 2018 Red-White-Blue Tournament on July 4th with 116 golfers (47 men, 44 seniors, and 25 women) 
- 2018 5-Club Tournament with 103 golfers (52 men, 32 seniors, and 21 women) 

- The analysis results for the first two tournaments were also supportive of a level playing field*. The second tournament did have some interesting outcomes that we will mention. However, the third tournament produced an “Aha!” moment that we will reveal later in this talk.

*The detailed results for these tournaments are presented in the Appendix.

Slopes of Gross Scores Vs. Handicaps for the Tournaments

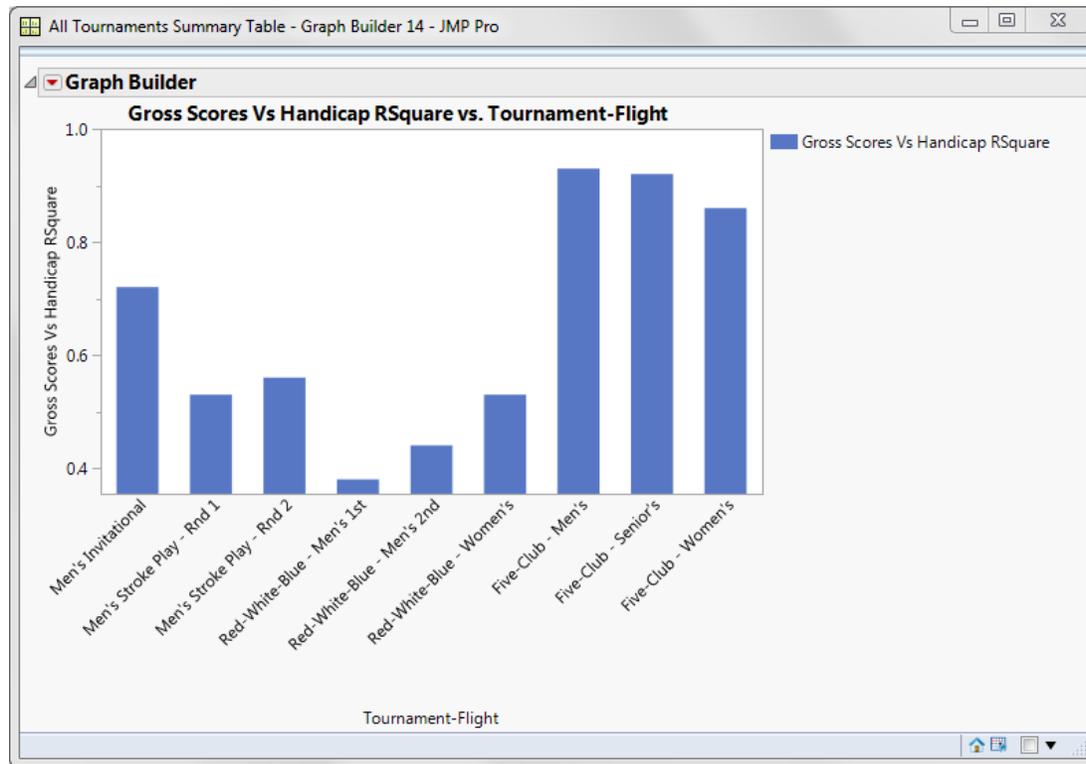
Slopes of Regression Lines



- With the exception of the Five-Club tournament, the results from the other three competitions were similar.
- There was a strong, linear, increasing, statistically significant relationship between the gross scores and the handicaps.
- For six different rounds across four tournaments the slopes of the regression lines were roughly 1.
- For the Five-Club competition, the slopes were more than double the other tournaments, reflecting the added difficulty of playing with only five clubs.

RSquares of Gross Scores Vs. Handicaps for the Tournaments

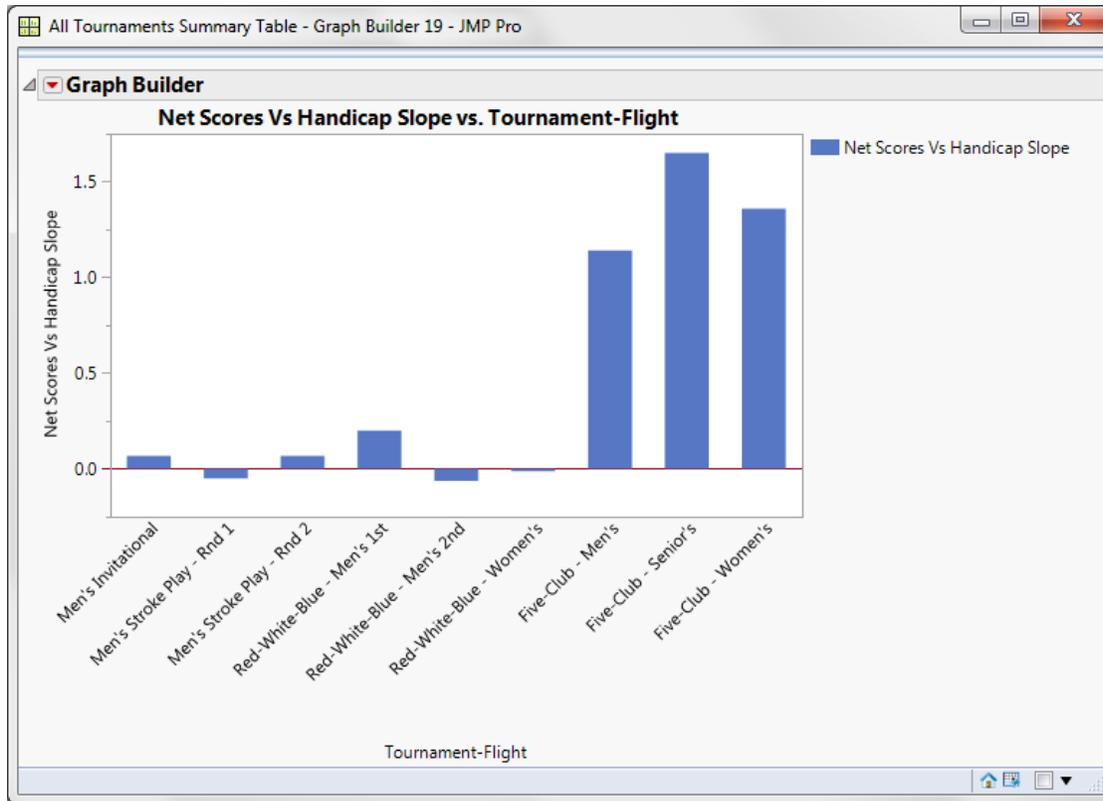
RSquares



- The regression line RSquares for the nine different tournament rounds ranged from a low of 0.38 to a high of 0.92.
- For the Five-Club competition, the RSquares were the highest of all tournaments, reflecting the importance of the handicap for this tough format.

Slopes of Net Scores Versus Handicaps for the Tournaments

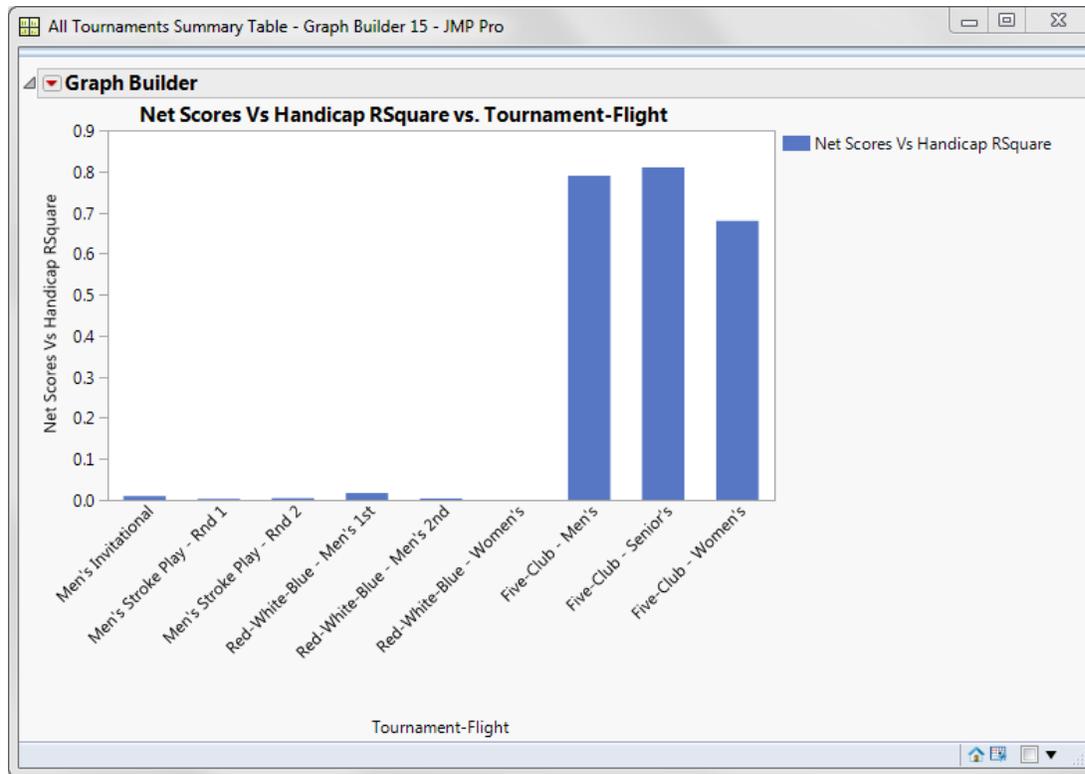
Slopes of Regression Lines



- With the exception of the Five-Club tournament, the results from other competitions were similar.
- There was no statistically significant relationship between the net scores and the handicaps. Slopes were near zero.
- The playing field was level for these six tournaments rounds.
- For the Five-Club competition, there were statistically significant slopes indicating that the net scores were actually increasing with handicaps.
- For the Five-Club competition, the playing field was not level.

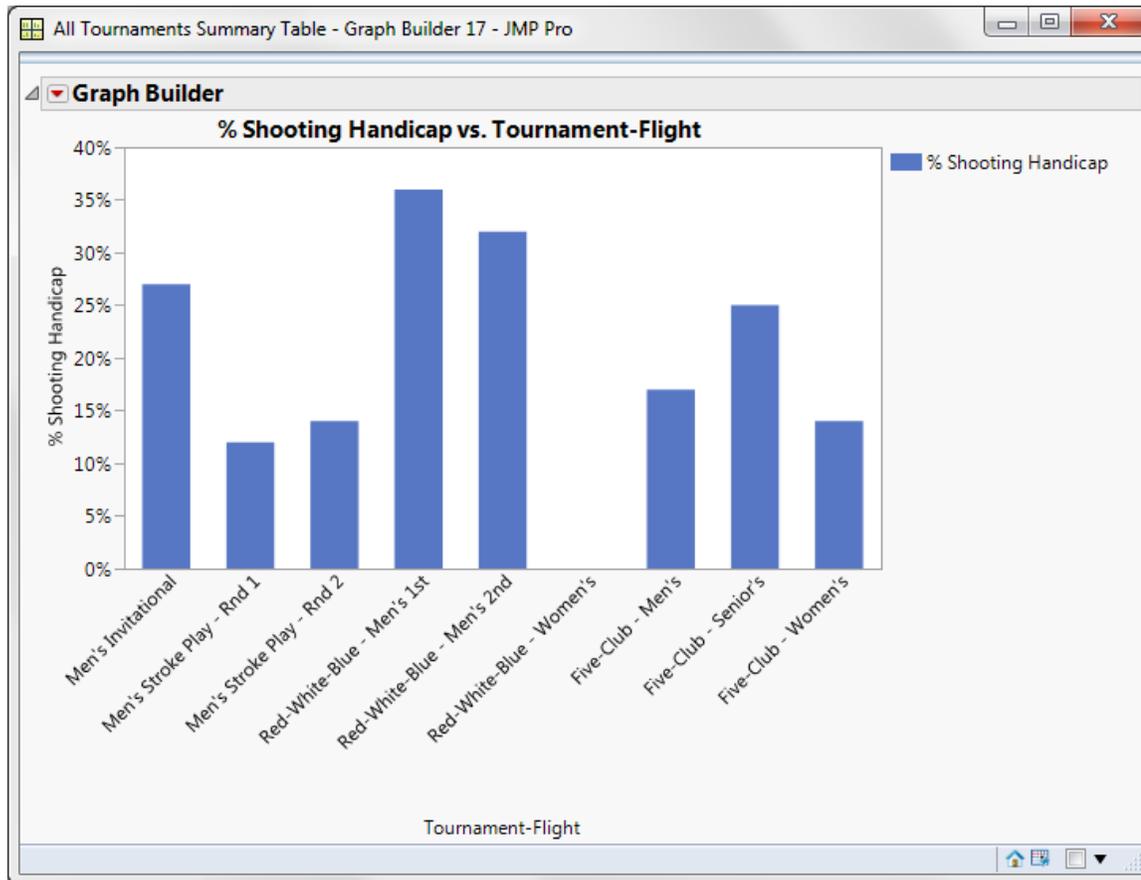
RSquares of Net Scores Vs. Handicaps for the Tournaments

RSquares



- Further confirmation that the Five-Club tournament was different occurred by viewing the RSquare estimates.
- For the other tournaments, the RSquare estimates were near zero, supporting a level playing field.
- For the Five-Club competition, the high and significant RSquares indicated that net scores rose with handicaps.

Percent “Shooting Their Handicap” for Net Score



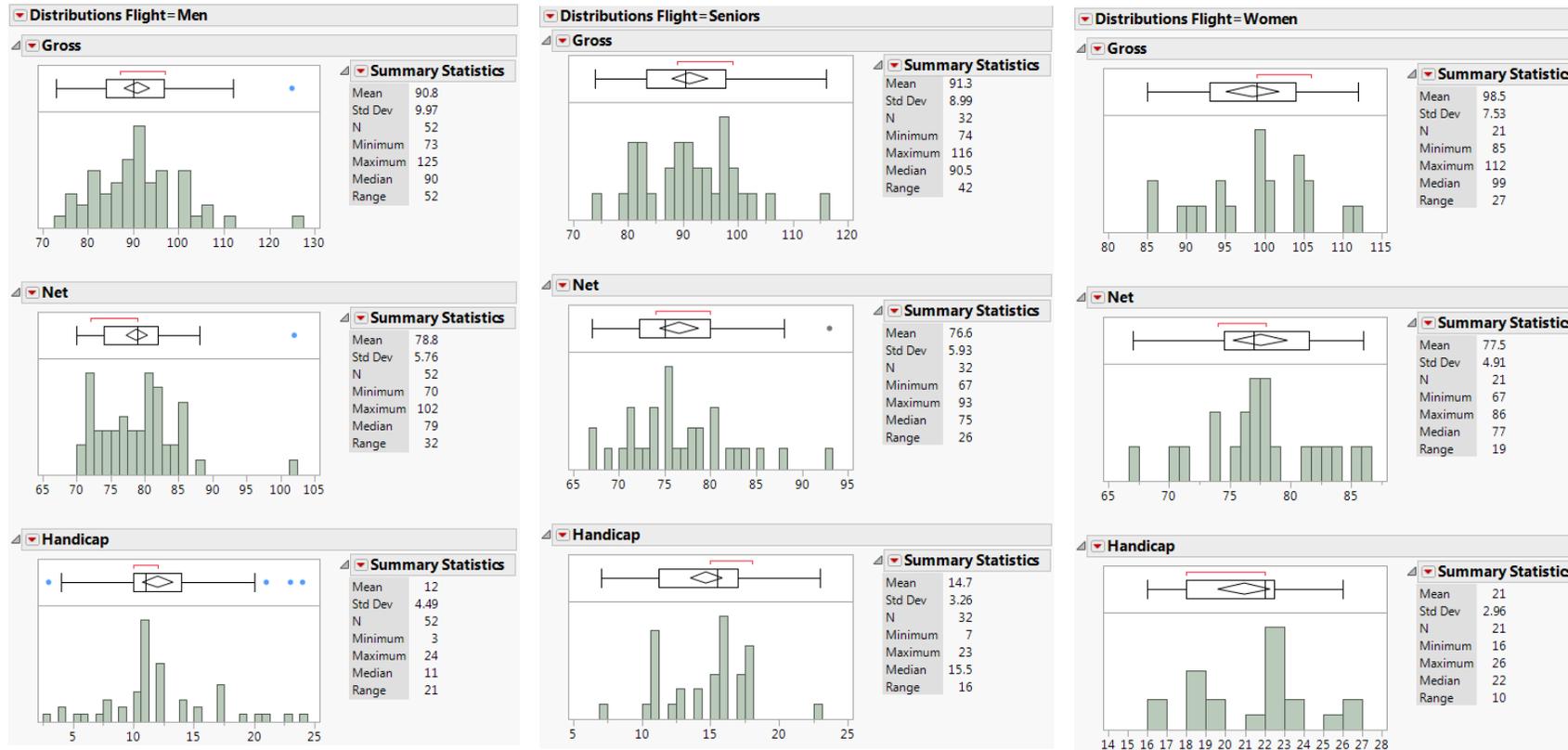
- The range of the percent shooting their handicap went from zero to 36%.
- For the Red-White-Blue tournament, the men's first flight had 36% shooting their handicap, the highest of all tournaments. This result is not too surprising since 6 of the 18 tees were played from the red tees, and men normally play from the longer blue or white tees.
- In contrast, for the women's flight, **no one** had a net score of par or better. Again, no surprise here since 12 of the 18 tees were the white and blue tees that women seldom played. Women typically play from the red tees.
- Although a tough format for women, all women are competing within a single division, which makes the competition fair.

Detailed Analysis of 5-Club Tournament



For this tournament, golfers are allowed to use any 5 clubs of their choice for the round instead of the normal maximum limit of 14.

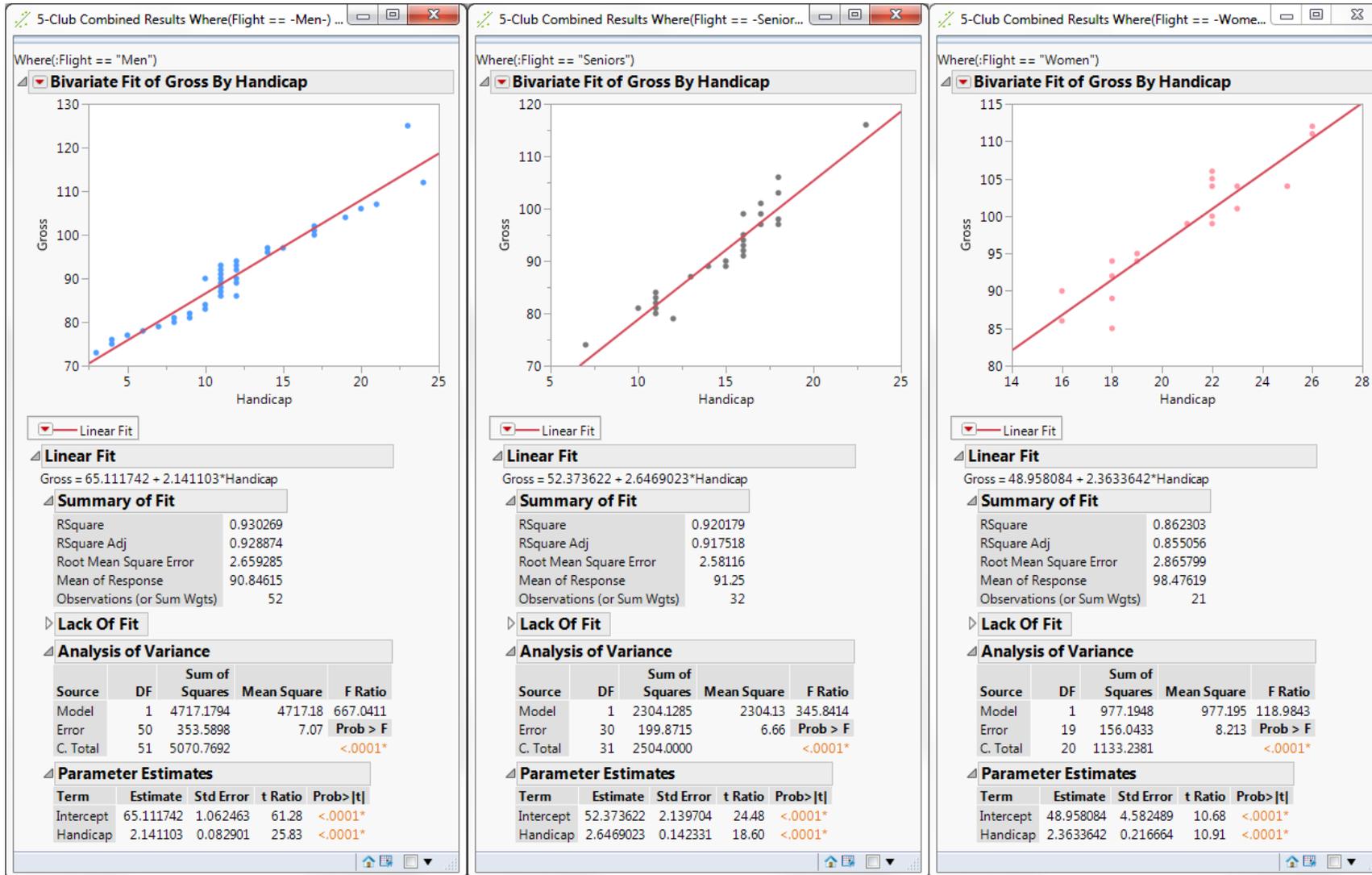
SCVCC 2018 5-Club Tournament



- A total of 105 golfers played in three separate flights: 52 men, 32 seniors, and 21 women).
- Each flight played from different tees: blue for men, white for seniors, and red for women in a single round.

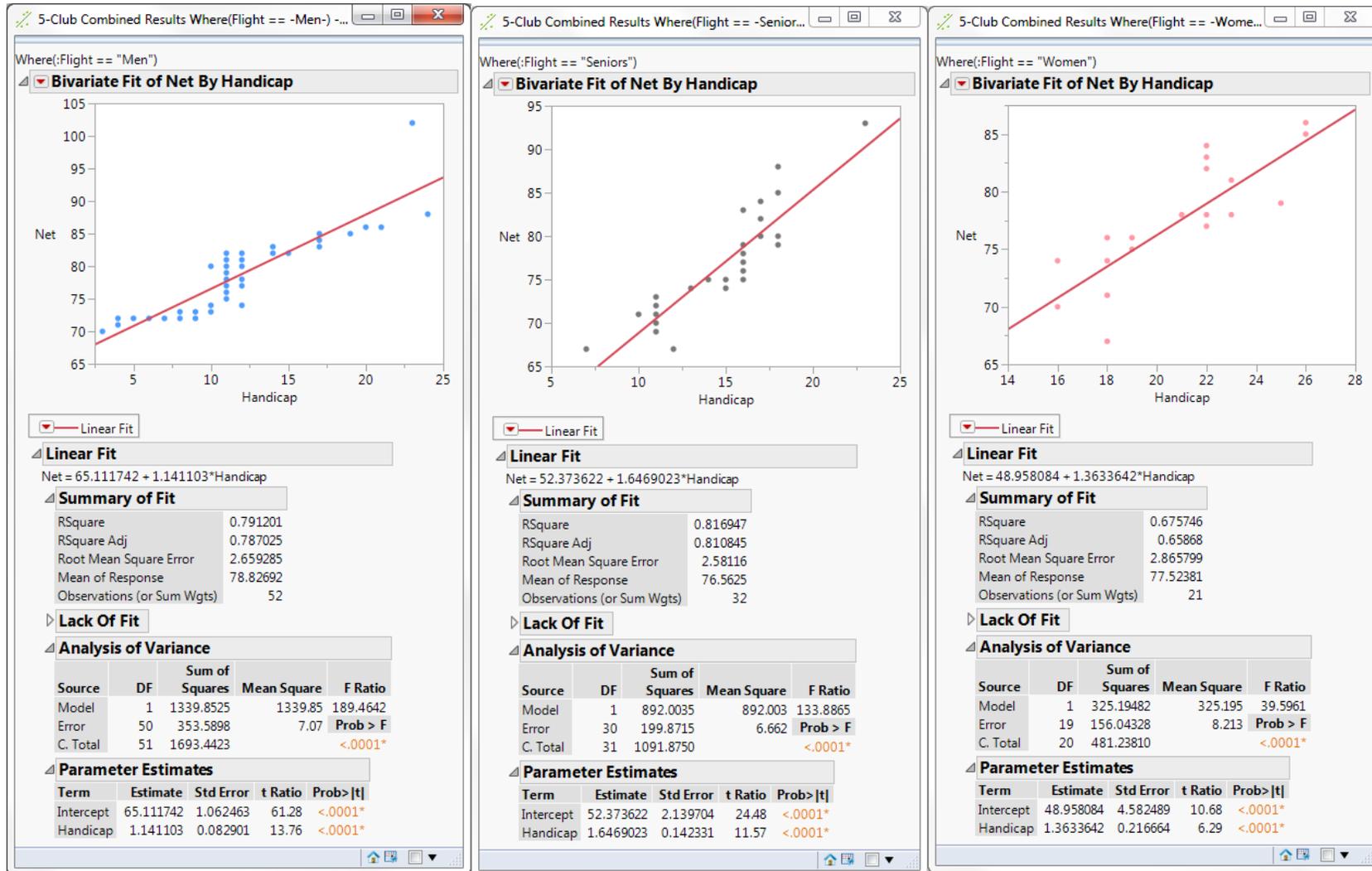
The men's handicaps ranged from 3 to 24, with median 11. The seniors' handicaps ranged from 7 to 23, with median 15.5, and the women's handicaps ranged from 16 to 26 with median 22.

5-Club Tournament: Gross Scores



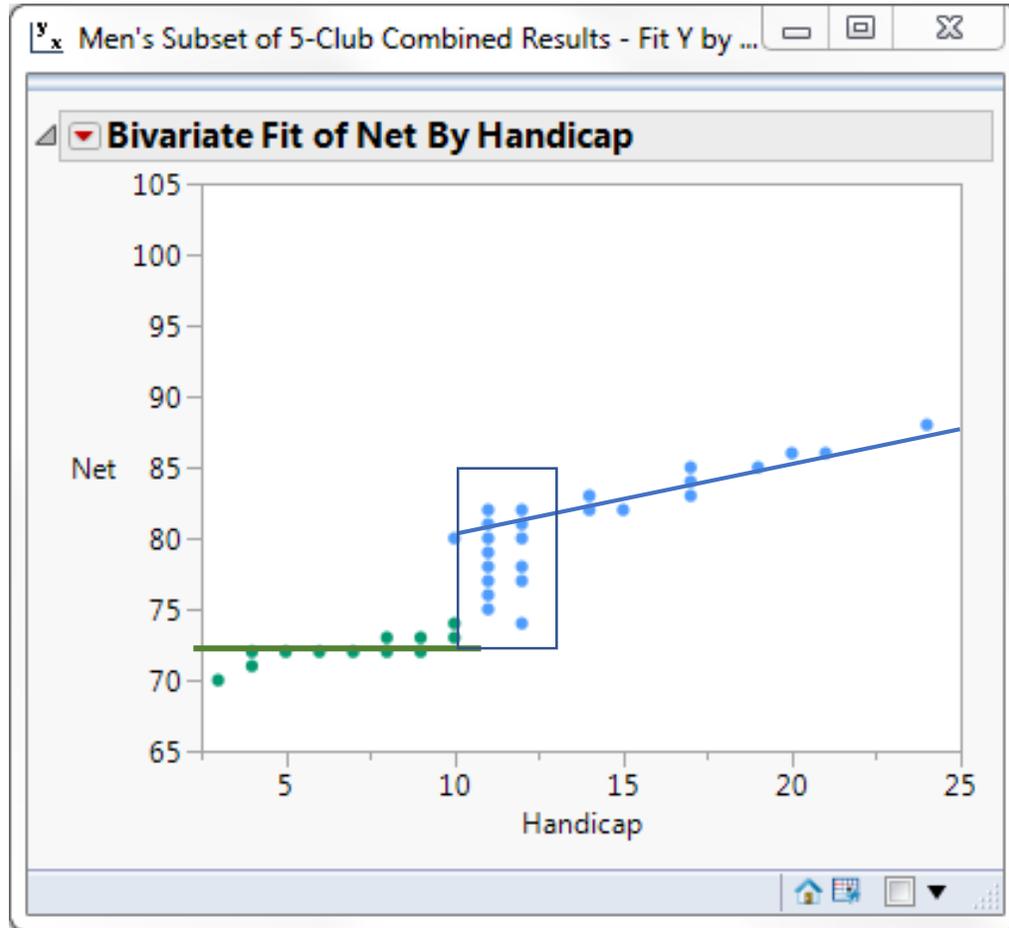
- As expected, all three flight groups show a similar, statistically significant, strong linear relationship between the gross score and the handicap.
- Slopes are >2 for all groups, that is, double other tournaments.
- RSquares are roughly 93%, 92%, and 86%, respectively, for the three groups.

5-Club Tournament: Net Scores, the Aha! Moment



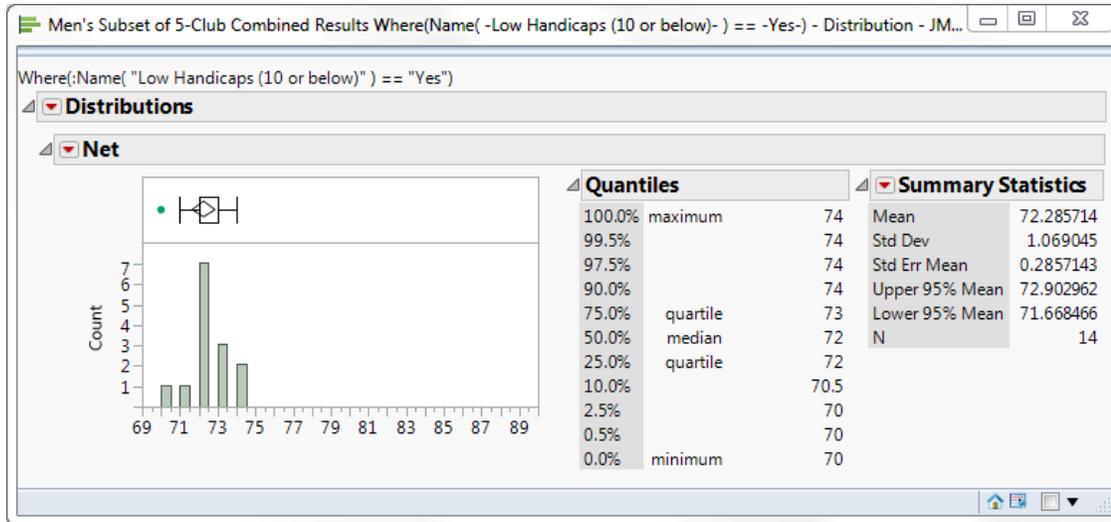
- A surprise occurs when we see statistically significant linear relationships between the net scores and the handicaps for all three flights.
- Slopes are all >1.
- RSquares are 79%, 82%, and 68%, respectively.
- **Unexpectedly, the handicaps are not producing a level playing field among the golfers.**

Further Insight for Men's Net Scores

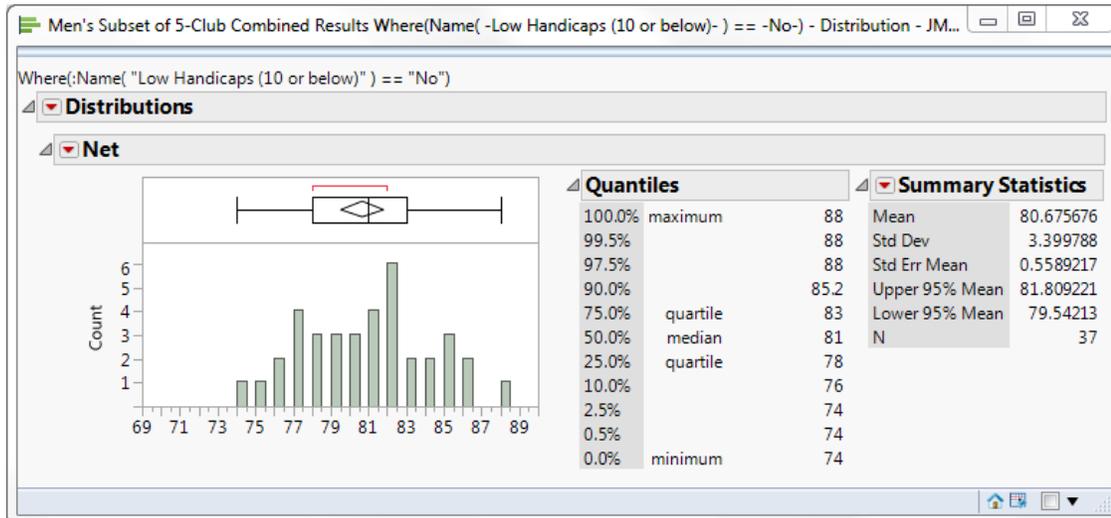


- There appears to be three distinct patterns in the net scores for men.
- One nearly flat pattern holds for handicaps of 10 or below, indicating a level playing field for that group.
- The second pattern shows a clustering around 11 or 12, a transition period.
- The third pattern shows a rising slope with handicaps for 13 and above, signifying a non level playing field.
- **We conclude that low handicap golfers do well even with a limited number of clubs compared to higher handicap golfers who struggle more with fewer clubs.**

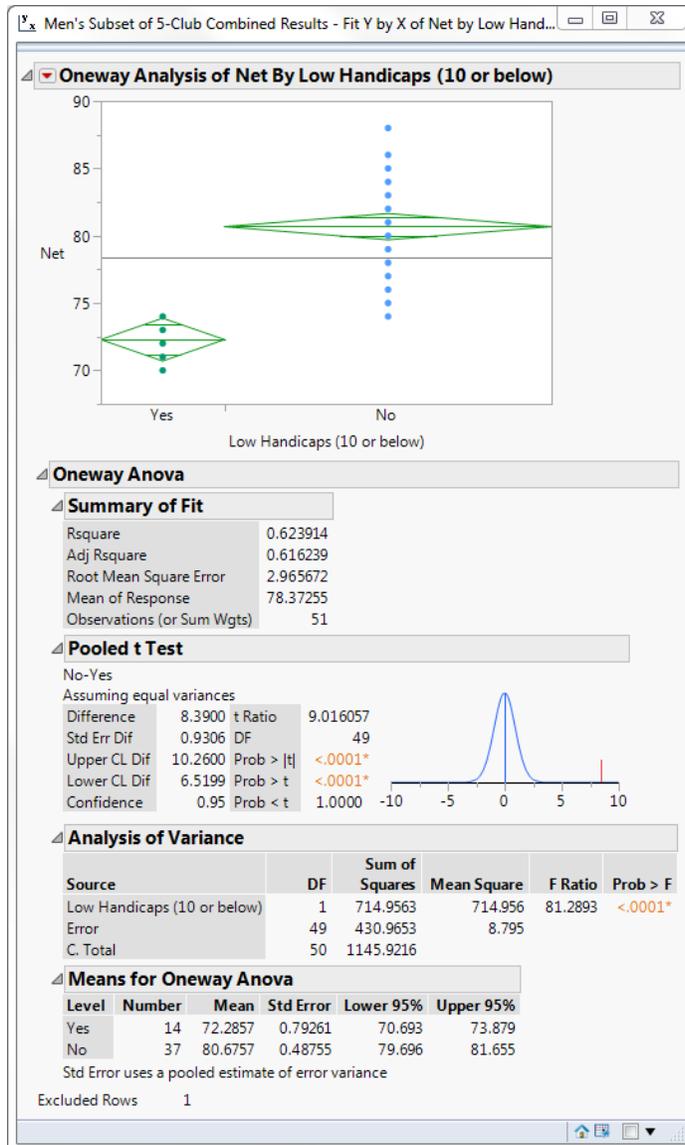
Comparison of Patterns for Men's Net Scores



- The mean net score for low handicaps of 10 or below is 72.3, which is close to par.
- The mean net score for higher handicaps of 11 or above is 81.7, which is nearly 10 strokes above par.



Test of Means for Men's Net Scores



- There is a statistically significant difference in the mean net scores between the low and high handicaps.
- Clearly, the 5-club tournament is a more difficult format for golfers, especially for those with high handicaps.
- **In this case, the handicaps do not level the playing field, and low handicap golfers have a distinct advantage playing in this format.**

Summary

- For most situations, the handicap system has the effect of leveling the playing field for golfers: men, seniors, and women.
- However, this is not the case when golfers play in the 5-club tournament, where low handicap golfers have a distinct skill advantage.
- JMP provides excellent visual and analytical capabilities for investigating the fairness of the handicapping system.

Appendix

- A. Introduction to USGA handicapping system
- B. Analysis of three other tournament scores

What is a “Handicap Differential” for a Round?

- A *handicap differential* is computed from four elements:
 1. The number 113 (the Slope Rating of a course of standard difficulty)
 2. Adjusted gross (ESC) score (adjustment for a “blow-up” score on a hole)
 3. USGA Course Rating (total yardage)
 4. Slope Rating (difficulty)
- The Handicap Differential formula is (to nearest tenth):

$$\frac{113 \times (\textit{Adjusted Gross Score} - \textit{USGA Course Rating})}{\textit{Slope Rating}}$$

For example, say the blue tees at a course have a slope rating of 135 and a course rating of 72.0. If a golfer shoots an adjusted gross score of 85, the differential would be $113 \times (85 - 72) / 135 = 10.9$.

Equitable Score Control (ESC)

- To exclude unusually high scores and be more representative of a player's potential ability, the equitable score control (ESC) table sets a limit to the number of strokes a player can take on a hole depending on that player's course handicap.
- For example, a player with a handicap of 15 is allowed a maximum of 7 strokes to be posted for handicap purposes on any hole, irrespective of the actual score on that hole.

ESC adjustment table

<u>Course Handicap</u>	<u>Maximum Number</u>
9 or less	Double Bogey
10-19	7
20-29	8
30-39	9
40 and above	10



Calculating the Handicap Index*



- Average the 10 best Handicap Differentials out of the last 20 rounds
- Multiply the average by 0.96
- Truncate, not round, to nearest tenth

*Handicap indexes are typically updated twice a month.

Handicap Index (Example Calculation in JMP)

	Date	Gross Score	Score Type	USGA Course Rating	Slope Rating	Handicap Differential	10 Lowest Differentials	Handicap Index
1	08/23/2018	87	H	69.9	131	14.8	14.8	14.4
2	08/21/2018	87	H	69.9	131	14.8	14.8	14.4
3	08/18/2018	93	H	72	135	17.6	•	14.4
4	08/16/2018	77	A	63.6	108	14.0	14	14.4
5	08/14/2018	94	H	69.9	131	20.8	•	14.4
6	08/12/2018	88	H	69.9	130	15.7	15.7	14.4
7	08/11/2018	94	H	70.9	132	19.8	•	14.4
8	08/09/2018	99	T	70.9	132	24.1	•	14.4
9	08/07/2018	88	A	68.2	128	17.5	•	14.4
10	08/05/2018	95	H	72	135	19.3	•	14.4
11	08/04/2018	95	T	72.5	136	18.7	•	14.4
12	07/22/2018	87	H	72	135	12.6	12.6	14.4
13	07/21/2018	90	T	70.9	132	16.4	16.4	14.4
14	07/19/2018	90	T	70.9	132	16.4	16.4	14.4
15	07/17/2018	90	H	69.9	131	17.3	•	14.4
16	07/15/2018	84	H	69.9	130	12.3	12.3	14.4
17	07/12/2018	89	H	70.8	123	16.7	16.7	14.4
18	07/08/2018	94	H	70.9	132	19.8	•	14.4
19	07/07/2013	96	T	70.9	132	21.5	•	14.4
20	07/03/2018	89	H	69.9	131	16.5	16.5	14.4

Handicap Differential Formula

$$\text{Round} \left(\frac{\left(\left(\text{Gross Score} - \text{USGA Course Rating} \right) \cdot 113 \right)}{\text{Slope Rating}}, 1 \right)$$

Handicap Index Formula

$$\frac{\text{Floor} \left(\left(\text{Col Mean} \left(10 \text{ Lowest Differentials} \right) \cdot 0.96 \right) \cdot 10 \right)}{10}$$

Formula for 10 Lowest Differentials

$$\text{If} \left(\text{Handicap Differential} < \text{Col Quantile} \left(\text{Handicap Differential}, 0.5 \right) \Rightarrow \text{Handicap Differential} \right. \\ \left. \text{else} \Rightarrow \text{else clause} \right)$$

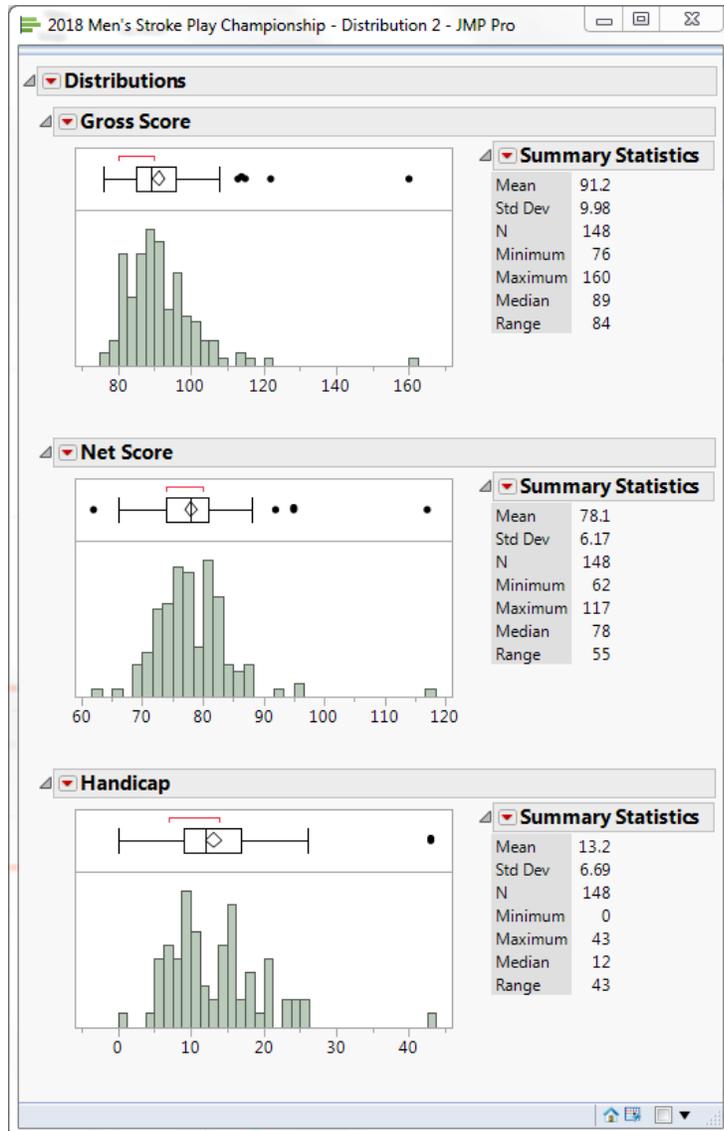
Score type:

H = Home

A = Away

T = Tournament

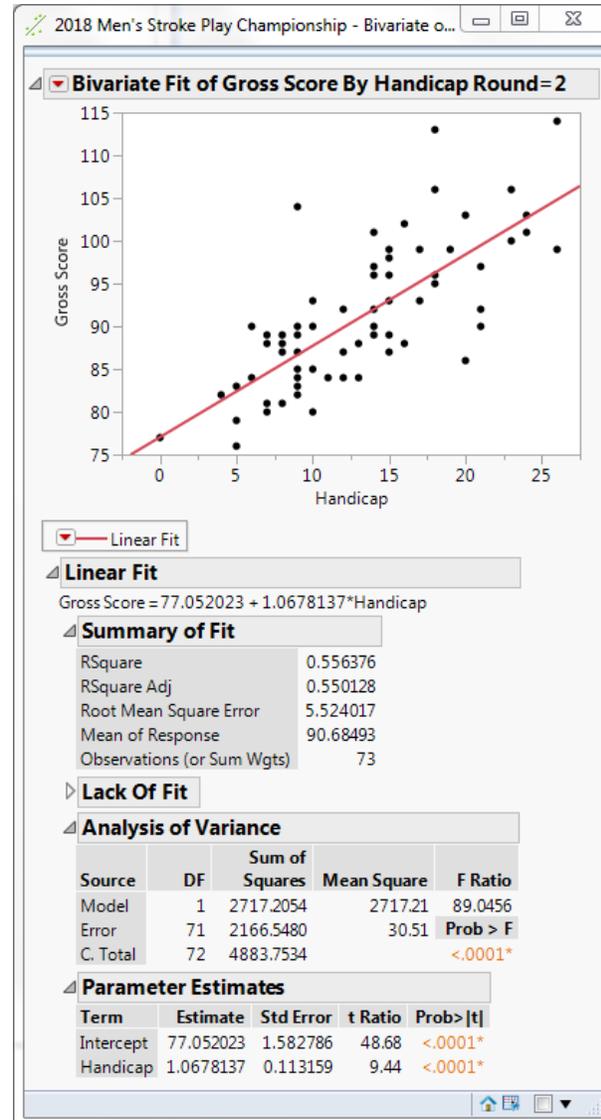
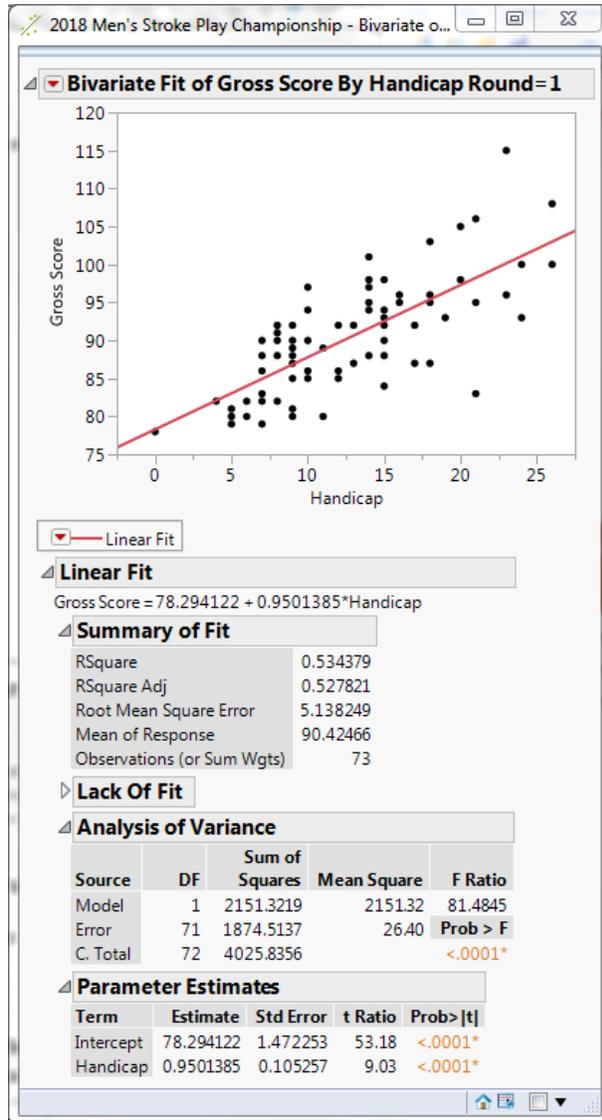
SCVCC 2018 Men's Stroke Play Championship



- A total of 74 men played the blues tees (par 72).
- The Gross Scores ranged from 74 to 160, with median 89.
- The Net Scores ranged from 62 to 117, with median 78.
- The handicaps ranged from 0 to 43, with median 12.

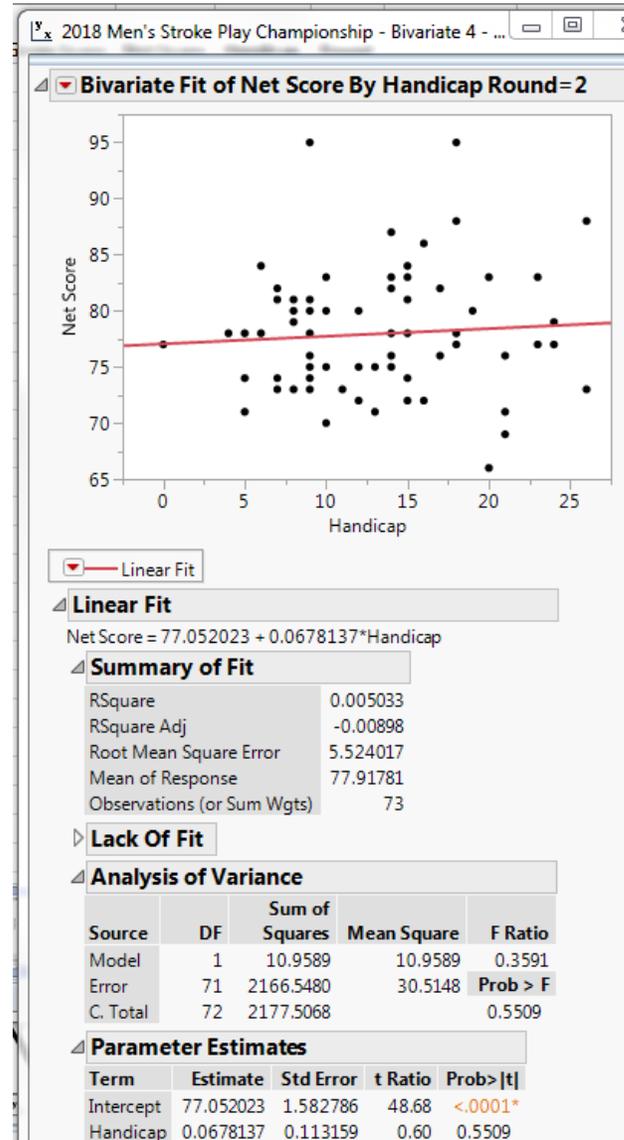
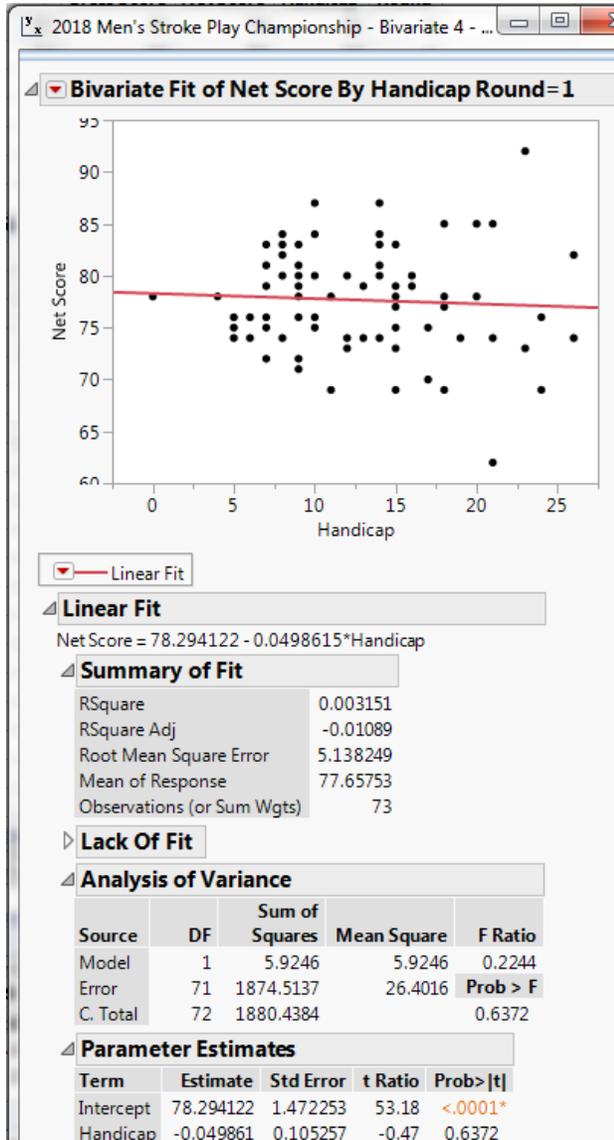
Exploring Outliers identified one score (gross 160, net 117, handicap 43) that we excluded.

Two Rounds of Gross Scores Versus Handicaps



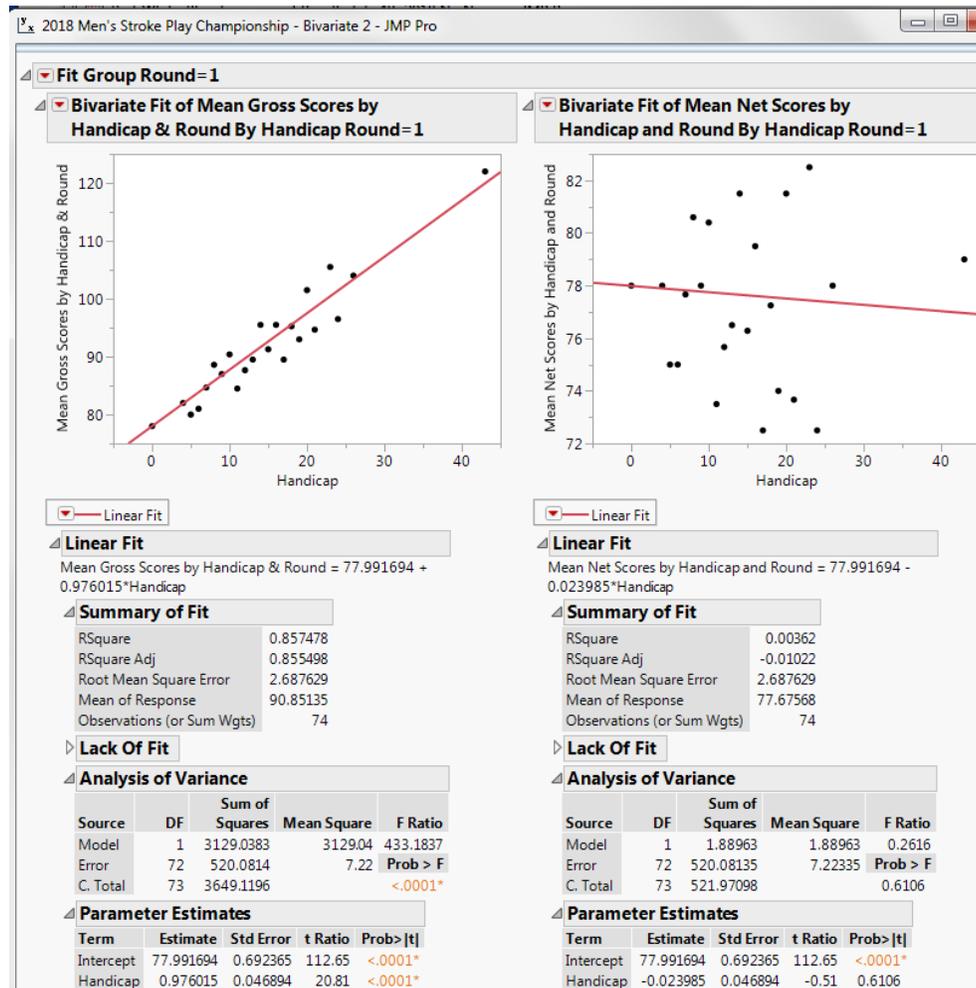
- Both rounds show a statistically significant, strong linear relationship between the gross score and the handicap.
- Slopes are ~1.
- RSquares are consistent for the two rounds at roughly 53% and 56%, respectively.

Two Rounds of Net Scores Versus Handicaps



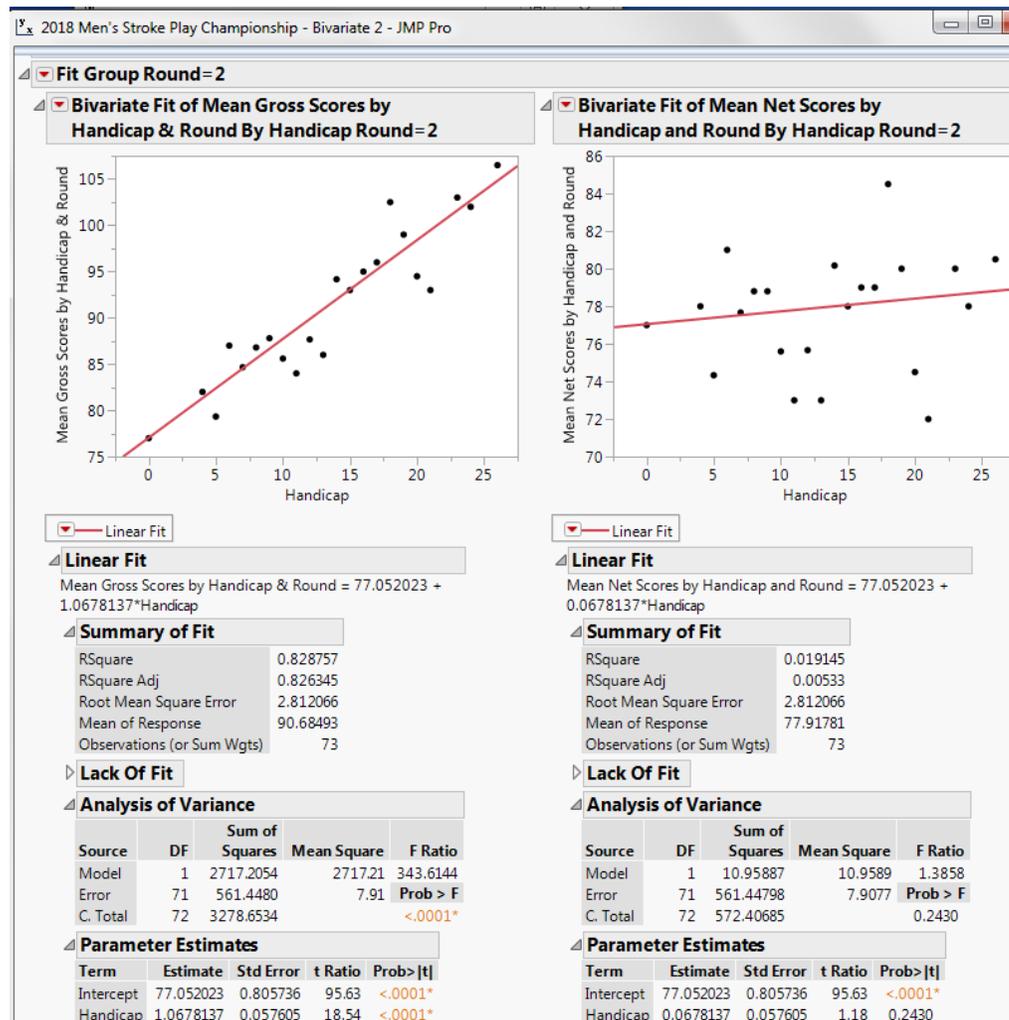
- Again we see the lack of a statistically significant relationship between the net scores and the handicaps for the two rounds.
- Slopes are ~ -0.05 and ~ 0.07 .
- RSquares are $\sim 0.3\%$ and $\sim 0.5\%$.
- As expected, the handicaps resulted in a level playing field among the golfers for both rounds.

First Round Mean Gross and Mean Net Scores Versus Handicaps



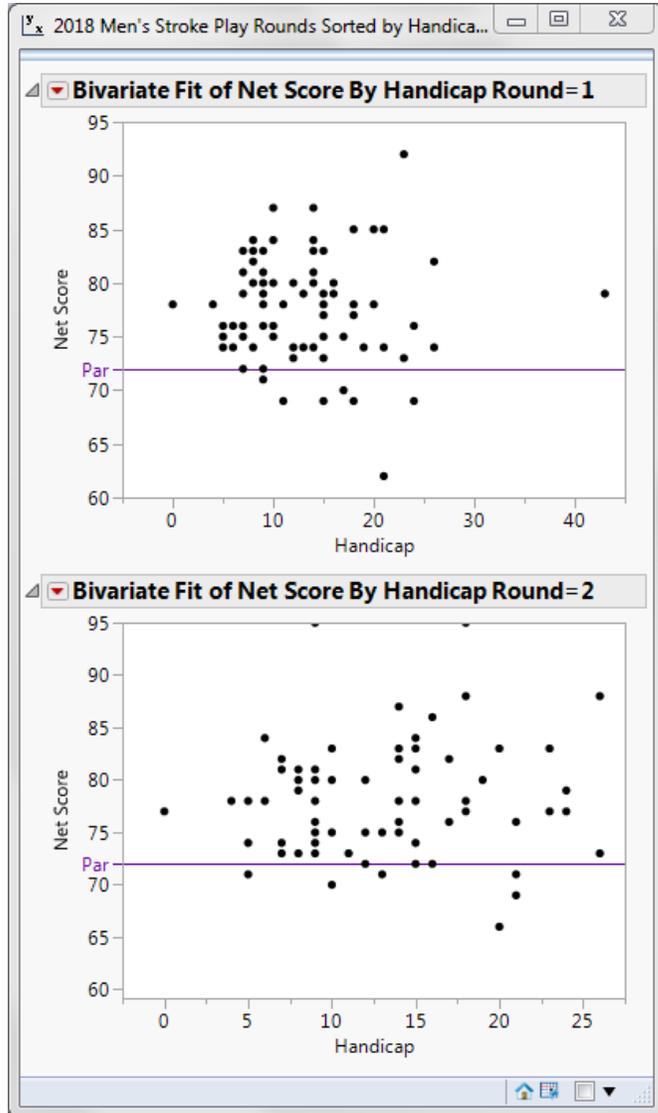
- There is a statistically significant, strong linear relationship between the mean gross scores and the handicaps.
- Slope is ~1.
- RSquare is ~86%.
- In contrast, there is no significant relationship between the mean net scores and the handicap.
- Slope is ~0.02.
- RSquare is ~0.4%.

Second Round Mean Gross and Mean Net Scores Versus Handicaps



- Similar to the first round, there is a statistically significant, strong linear relationship between the mean gross scores and the handicaps.
- Slope is ~ 1 .
- RSquare is $\sim 83\%$.
- In contrast, there is no significant relationship between the mean net scores and the handicap.
- Slope is ~ 0.07 .
- RSquare is $\sim 2\%$.
- Both rounds confirm a fairly level playing field.

“Shooting a Handicap”



- In the first round, 9 or $9/74 = 12\%$ had net scores of par (72) or better.
- In the second round, 10 or $10/74 = 13.5\%$ had net scores of par (72) or better.
- Combined, 19 golfers or 12.8% shot their handicap in either round.

SCVCC 2018 Red-White-Blue Tournament



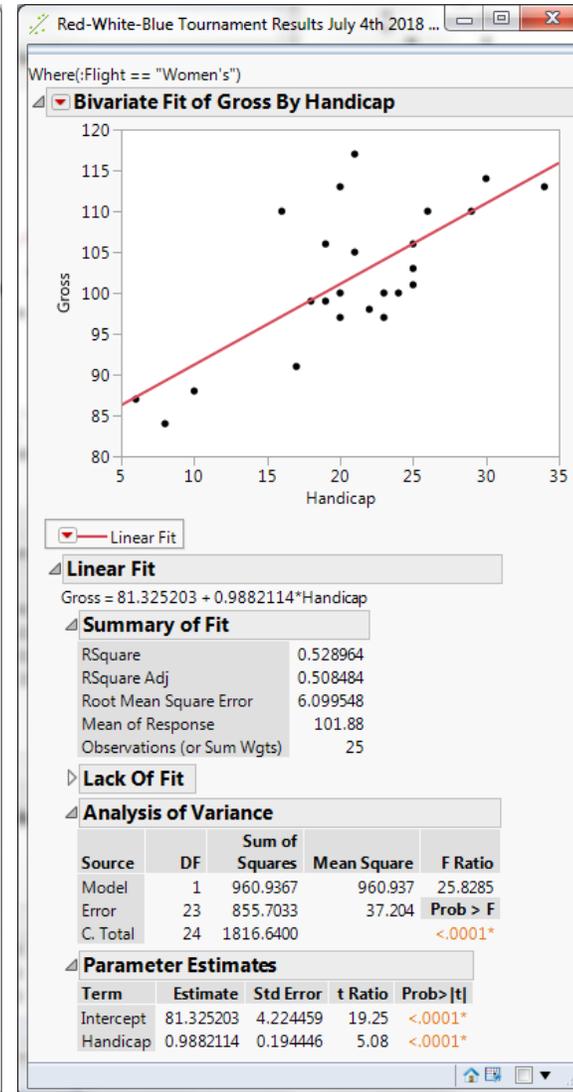
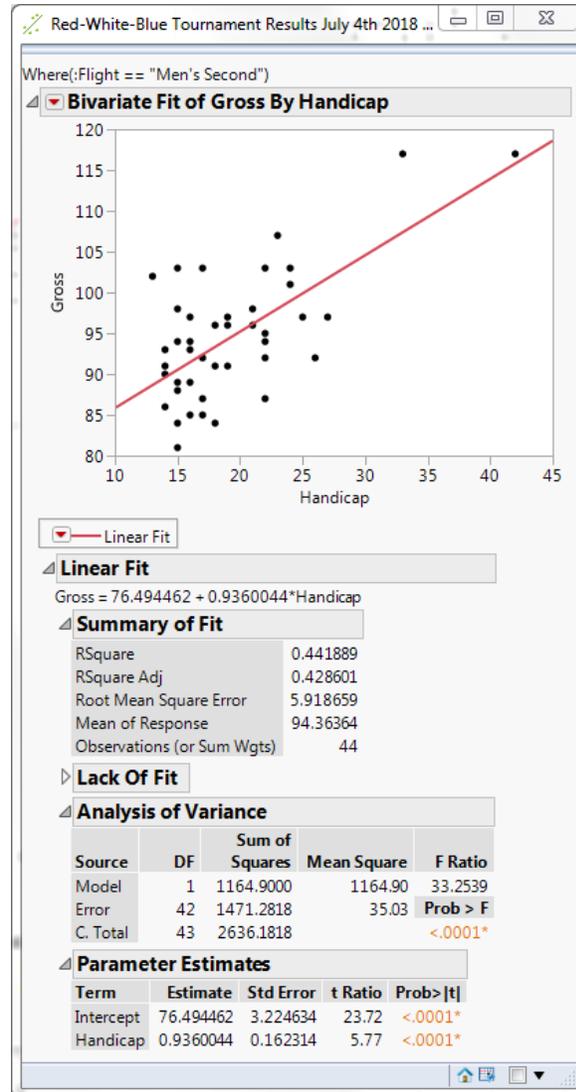
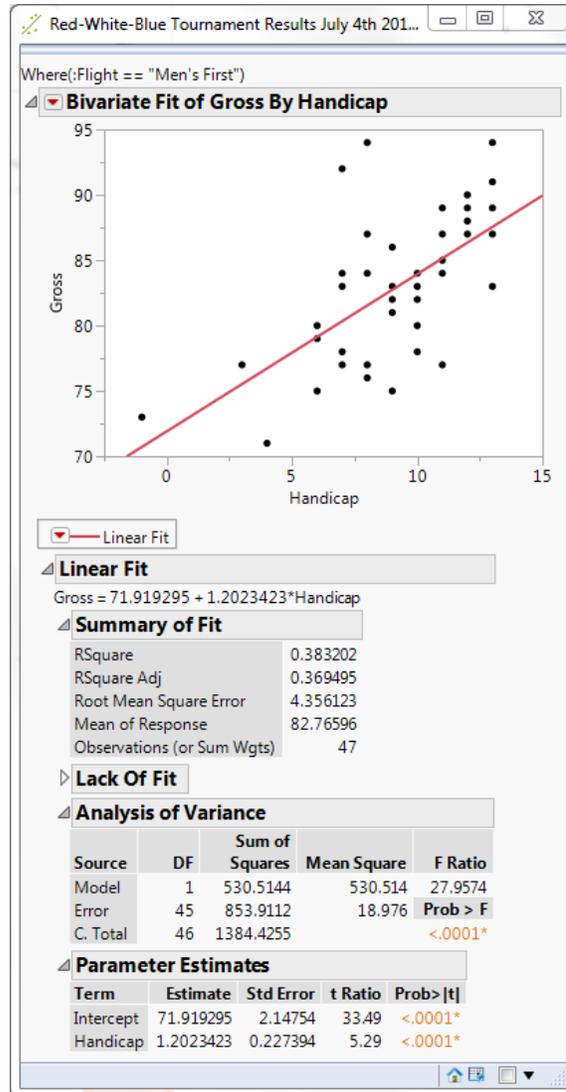
Exploring Outliers did not detect any outliers in net scores in any group.

A total of 116 golfers (91 men and 25 women) played from three different sets of tees (6 red, 6 white, and 6 blue) of their choice in a single round.

The men's division was divided into two flights by handicaps: below and above 13. Handicaps ranged from -1 to 42.

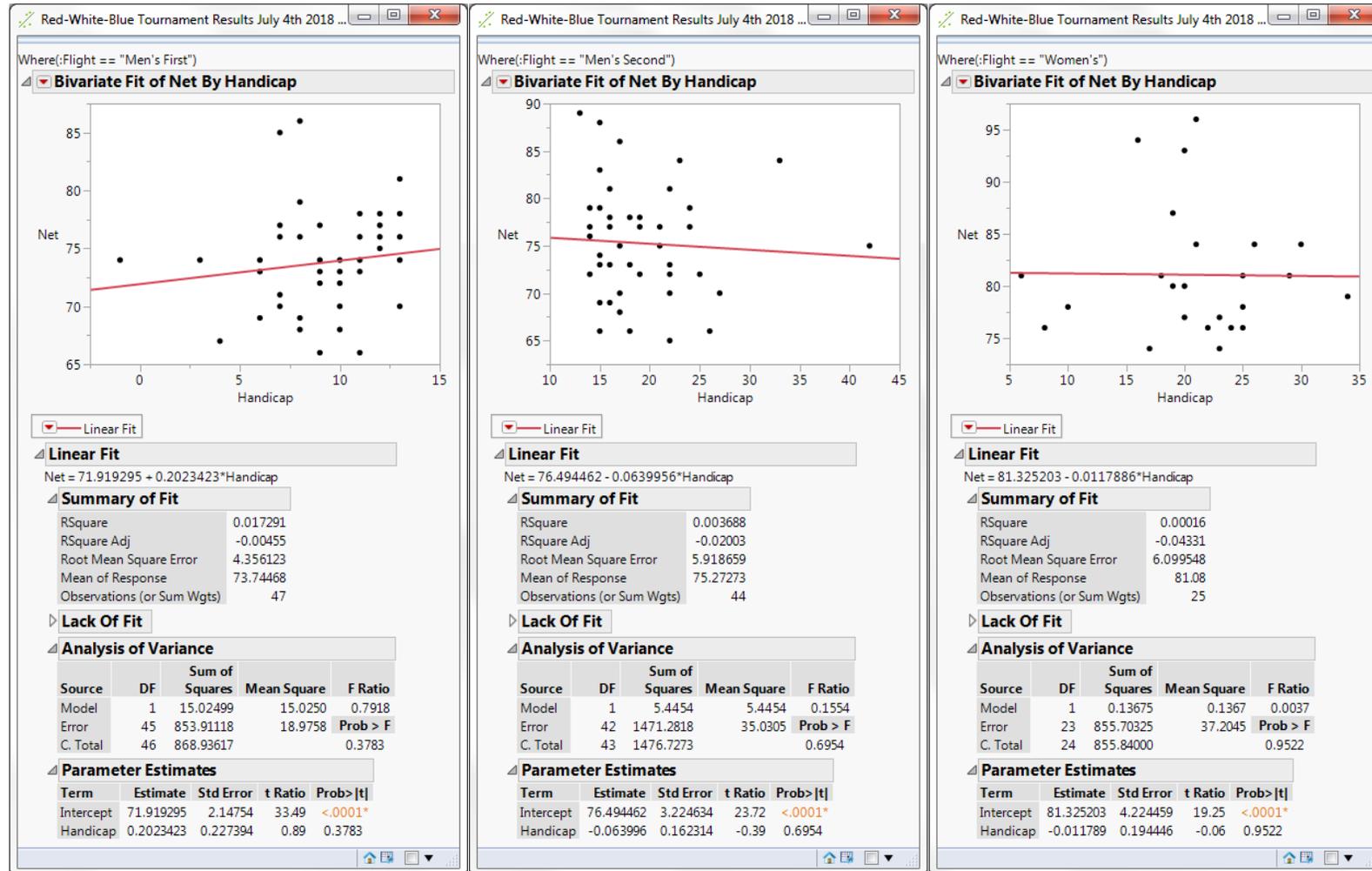
The women were in a separate flight with handicaps ranging from 6 to 34.

Red-White-Blue Tournament: Gross Scores



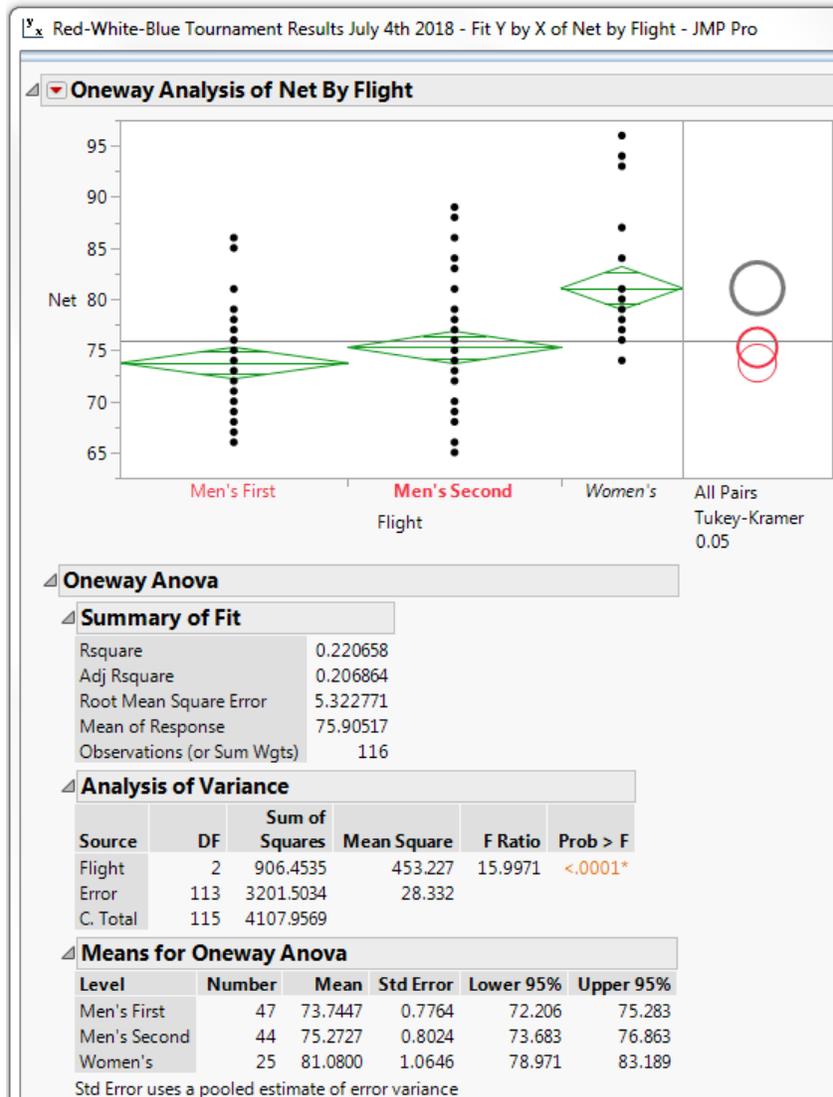
- All three flight groups show a similar, statistically significant, strong linear relationship between the gross score and the handicap.
- Slopes are ~1.
- RSquares are roughly 38%, 44%, and 53%, respectively, for the three groups.

Red-White-Blue Tournament: Net Scores

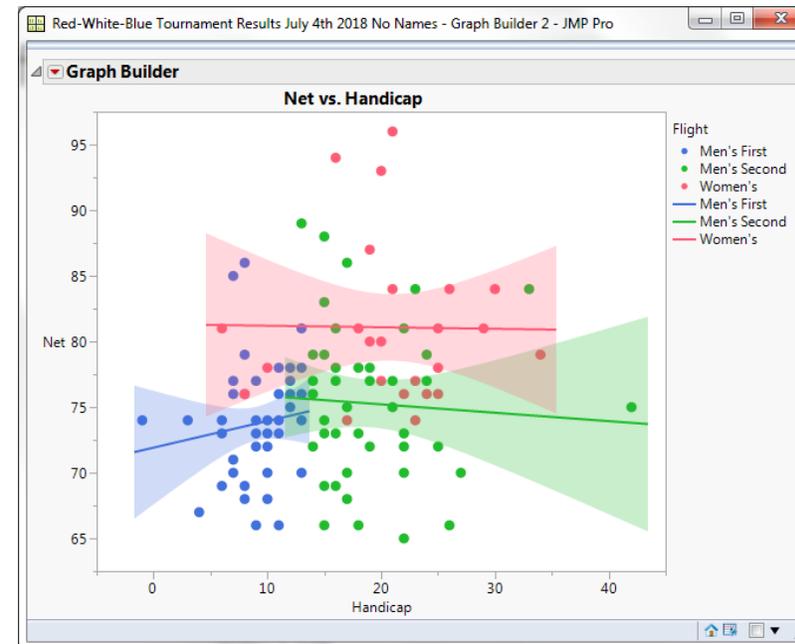


- There is a lack of statistically significant relationships between the net scores and the handicaps for all three groups.
- RSquares are only about 1.7%, 0.4%, and 0.02%, respectively.
- The data confirms that the handicaps resulted in a level playing field among the golfers within any group.

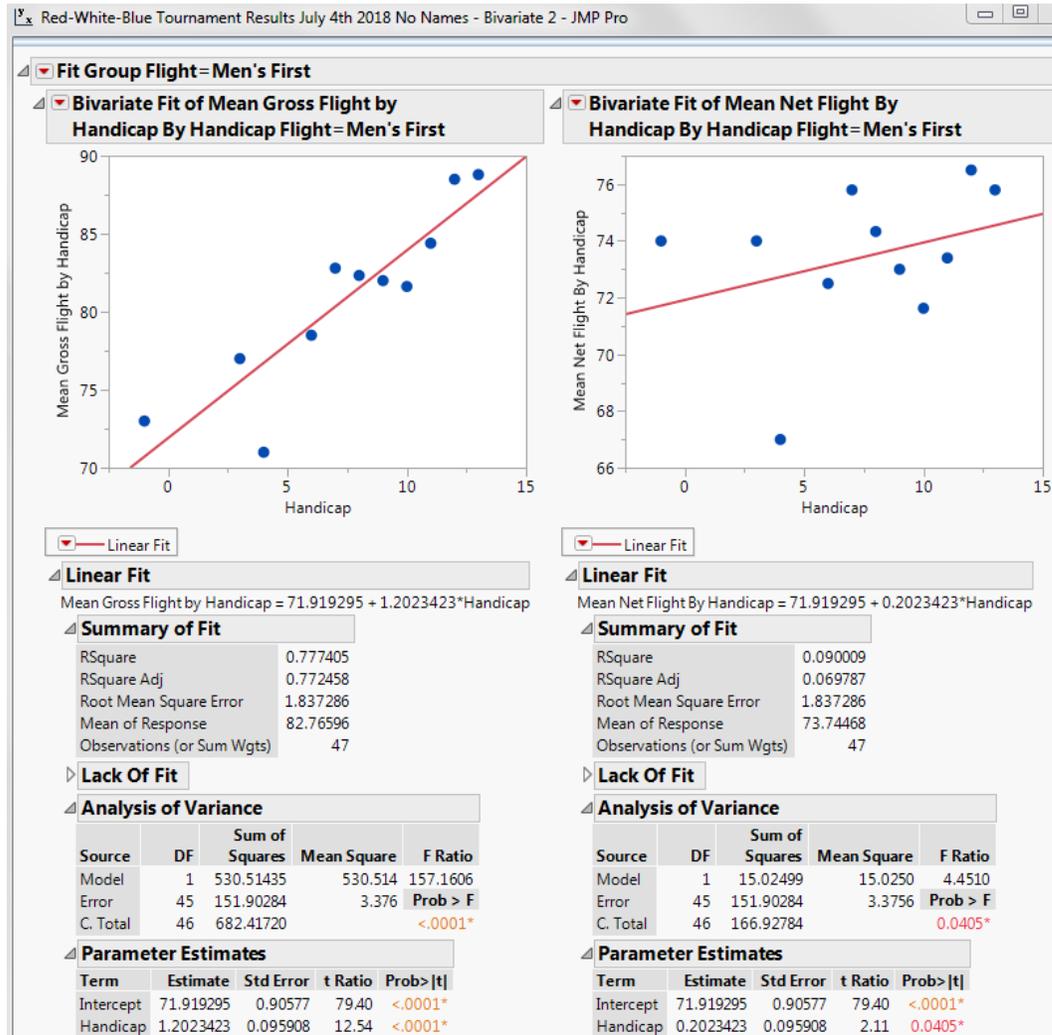
Test of the Equality of Net Scores Across Flights



- There is a statistically significant difference between the mean scores for each flight.
- Here we use All Pairs, Tukey's HSD Means Comparison test.
- An alternative representation is done using Graph Builder.

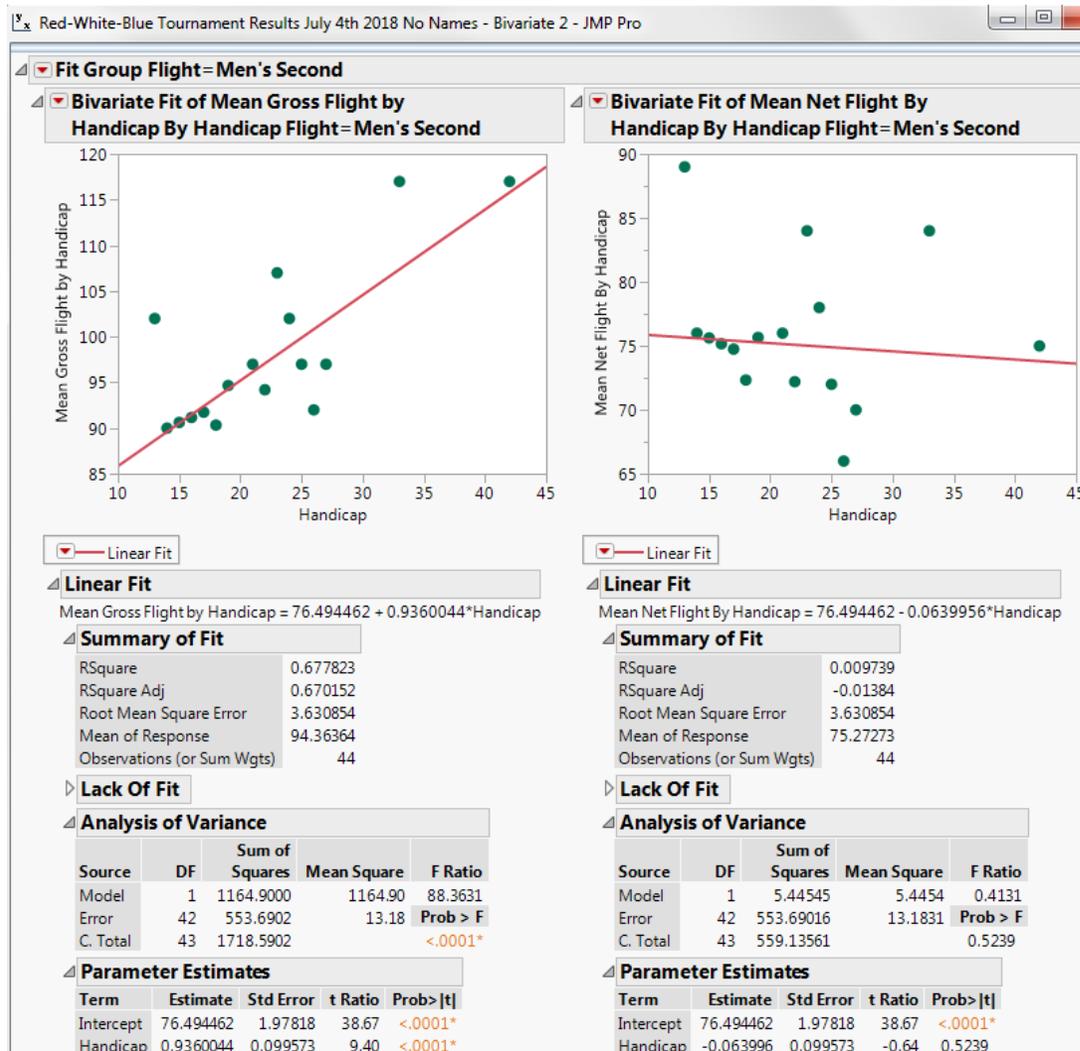


Men's First Flight Mean Gross and Mean Net Scores Versus Handicaps



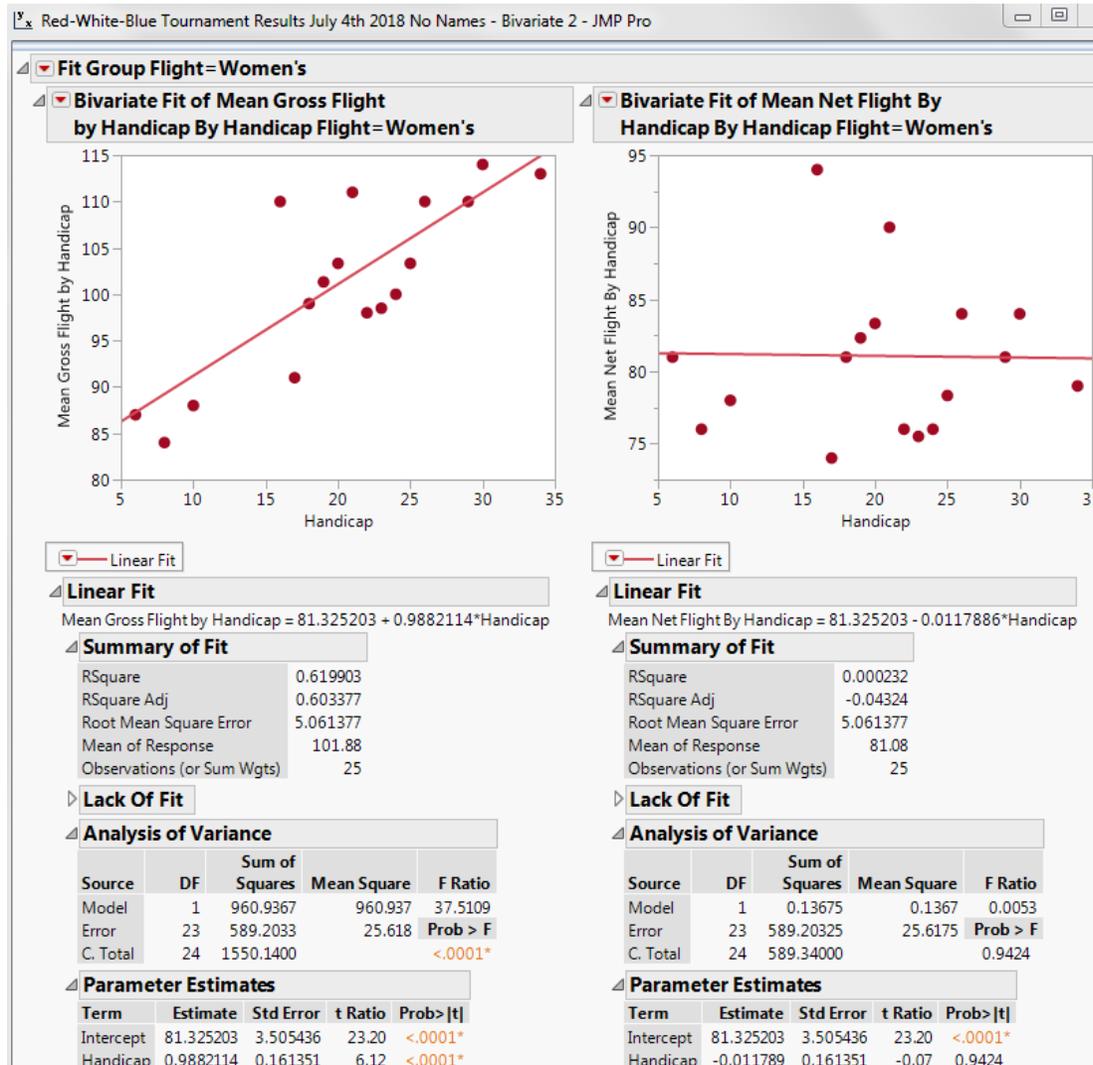
- There is a statistically significant, strong linear relationship between the mean gross scores and the handicaps.
- Slope is ~1.
- RSquare is ~78%.
- There is a significant but weak relationship between the mean net scores and the handicap.
- Slope is ~0.2.
- RSquare is only ~9%.

Men's Second Flight Mean Gross and Mean Net Scores Versus Handicaps



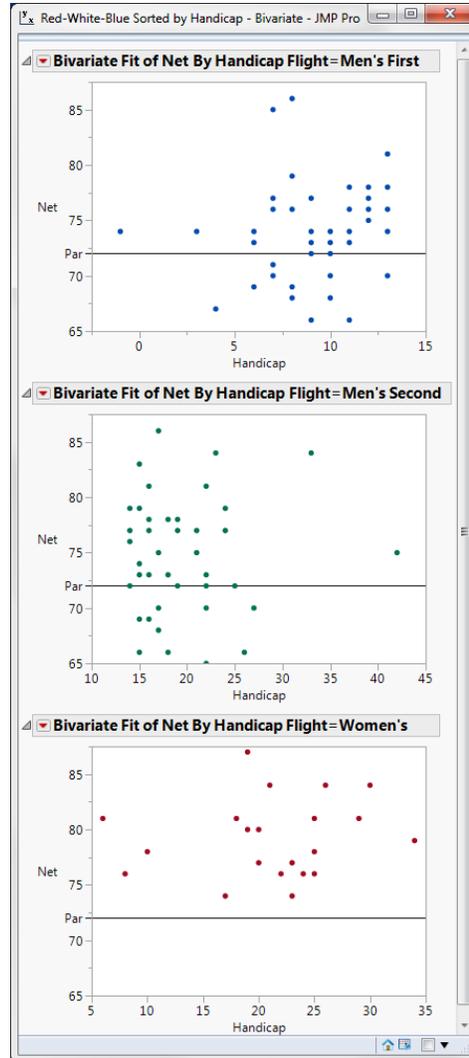
- Similar to the first flight, there is a statistically significant, strong linear relationship between the mean gross scores and the handicaps.
- Slope is ~ 1 .
- RSquare is $\sim 68\%$.
- In contrast, there is no significant relationship between the mean net scores and the handicap.
- Slope is ~ -0.06 .
- RSquare is $\sim 1\%$.

Women's Flight Mean Gross and Mean Net Scores Versus Handicaps



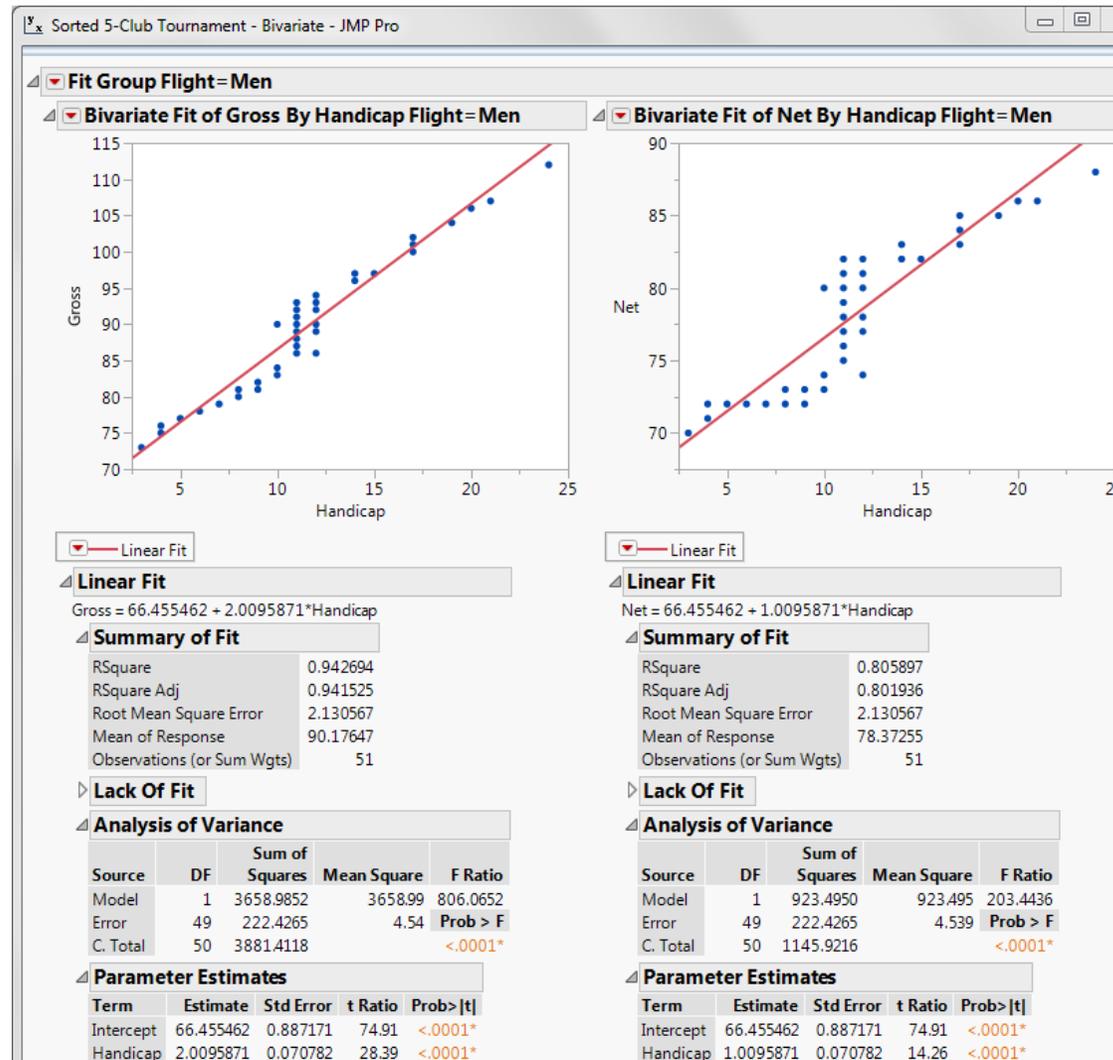
- Similar to the Men's flights, there is a statistically significant, strong linear relationship between the mean gross scores and the handicaps.
- Slope is ~ 1 .
- RSquare is $\sim 62\%$.
- In contrast, there is no significant relationship between the mean net scores and the handicap.
- Slope is ~ -0.01 .
- RSquare is $\sim 0.02\%$.
- The handicaps appear to have leveled the playing field across all three flights.

“Shooting a Handicap”



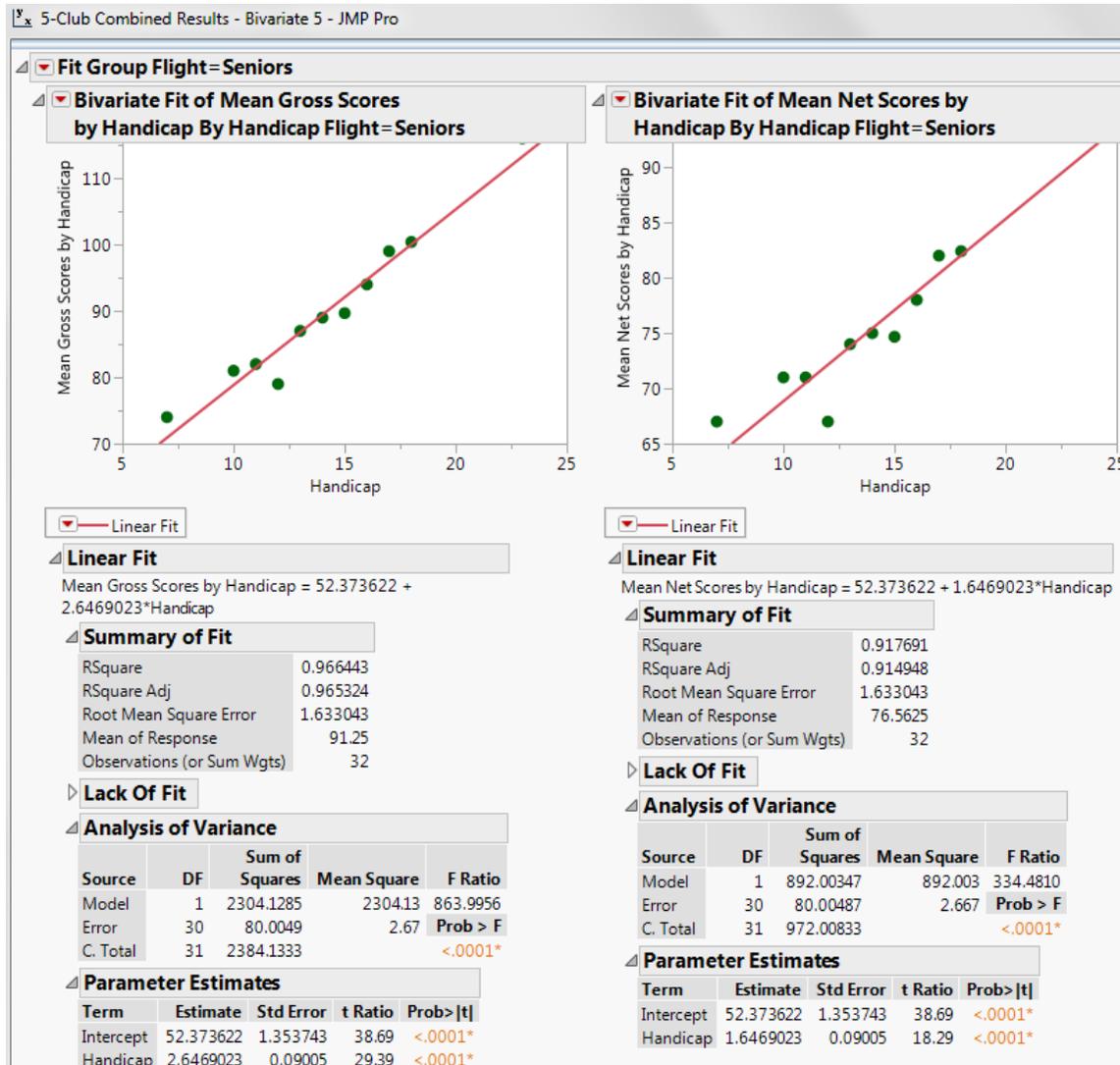
- For the men’s first flight, 17 or 17/47 = 36% had net scores of par or better. This is no surprise since 6 of the 18 tees were played from the red tees.
- For the men’s second flight, 14 or 14/44 = 32% had net scores of par or better.
- For the women’s flight, no one had a net score of par or better. Again, this is not surprising since 12 of the 18 tees were played from the white and blue tees. Women nearly always play from the shorter red tees.

Men's Flight Mean Gross and Mean Net Scores Versus Handicaps



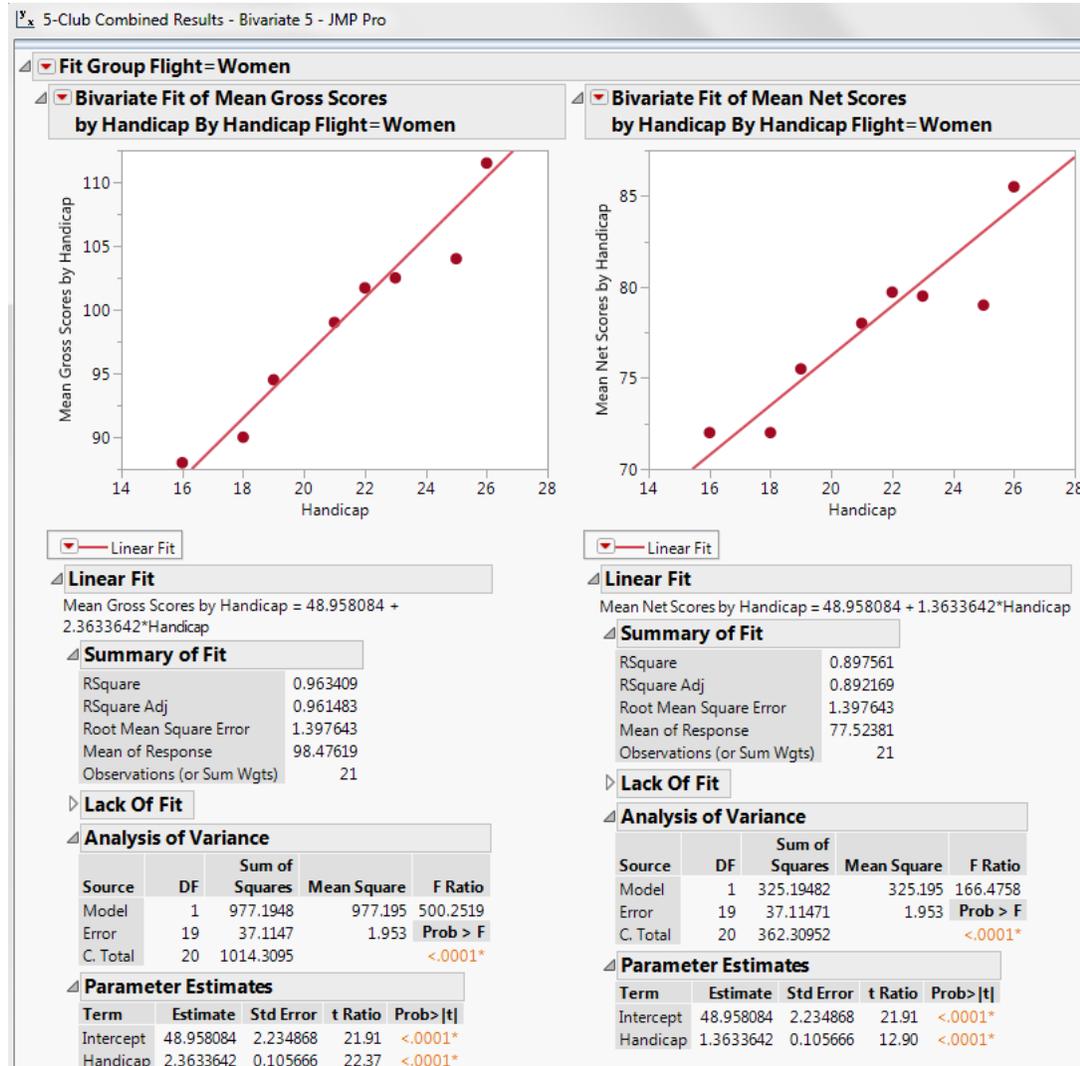
- There is a statistically significant, strong linear relationship between the mean gross scores and the handicaps.
- Slope is ~2.
- RSquare is ~94%.
- In contrast to previous tournaments, there is a statistically significant and strong relationship between the mean net scores and the handicap.
- Slope is ~1.
- RSquare is ~81%.

Seniors' Flight Mean Gross and Mean Net Scores Versus Handicaps



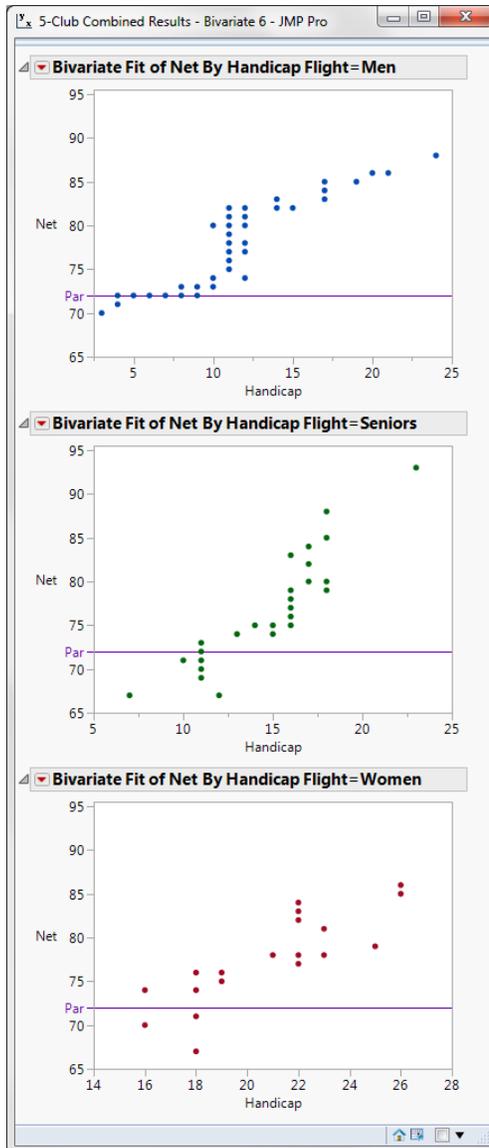
- Similar to the Men's flight, there is a statistically significant, strong linear relationship between the mean gross scores and the handicaps.
- Slope is ~2.6.
- RSquare is ~97%.
- In contrast to previous tournaments, there is a strong significant relationship between the mean net scores and the handicap.
- Slope is ~1.6.
- RSquare is ~92%.

Women's Flight Mean Gross and Mean Net Scores Versus Handicaps



- Similar to the Men's and Seniors' flights, there is a statistically significant, strong linear relationship between the mean gross scores and the handicaps.
- Slope is ~2.4.
- RSquare is ~96%.
- In contrast to previous tournaments, there is a strong and significant relationship between the mean net scores and the handicap.
- Slope is ~1.4.
- RSquare is ~90%.
- For the 5-club event, the handicaps have not leveled the playing field across all three flights.

“Shooting a Handicap”



- For the men’s flight, 9 or $9/52 = 17\%$ had net scores of par (72) or better.
- For the seniors’ flight, 8 or $8/32 = 25\%$ had net scores of par or better.
- For the women’s flight, only 3 or $3/21 = 14\%$ had net scores of par or better.