The USGA Groove Rule:
Are Accurate Golfers Earning Premiums?

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-Background-

Beginning in 2010, professional golfers who played in events that recognized rules of play established by the United States Golf Association (USGA) or the Royal & Ancient Society (R&A) could no long use so-called “square grooves” on the clubs with which they competed because both governing bodies adopted a rule reduced the depth and sharpness with which grooves could be made. By changing groove specifications along these lines, players’ abilities to spin the ball, especially from chaotic environments like the tall grass, were reduced. And spin allows players control the ball better.

It is probably safe to say that the rule change did not have an easily noticeable impact on the game. The average golf viewer would be hard-pressed to note differences between the game in 2010 and 2009. However, on the margins, players were likely forced to change their approaches to the game because, on certain occasions, they were less able to control the ball following the rule change. In a discussion about the rule change that appeared in *Sports Illustrated*, an anonymous professional golfer said, “The new grooves rule goes into effect on Jan. 1, and grooves are going to be a bigger deal than the players thought. I tried out some [2010 conforming irons] in California on a course with firm greens and couldn't believe how little spin I got on greenside shots. I've already decided to switch to a softer ball.”

The decision to change groove specifications was not an overnight revelation to the USGA. It attempted to make changes to the groove specifications in the mid-1980s, when club manufacturers like Ping started to produce clubs with deeper, sharper “U-grooves.” However, legal action against the USGA prevented the governing body from regulating successfully groove specifications. In the interim, massive technological change in the manufacturing of

clubs and golf balls effectively changed the trade-off between generating power and maintaining accuracy, as the costs of mishitting shots fell with each technological innovation.

In the last ten years, the USGA and the R&A have increased efforts to study the effect that groove construction had on spin generation. It published a series of studies on the topic, finally printing its last word on the subject in 2007. This study showed that spin rates of shots, as measured in revolutions per minute, and launch angles of shots were higher with deeper, sharper grooves. In turn, shots would not take as long to stop on greens, especially out of longer grass. In other words, the penalty for not hitting a tee shot into the fairway fell.

Increasing the cost of mishits appears to be the reason the USGA decided to adopt the rule changes, as it is on record as stating that its intent in adopting the new rule was to place renewed emphasis on accuracy over power. In an interview published on its website, it says, "The changes are designed to reduce spin on shots played from the rough by highly skilled golfers, and thereby restore the challenge of shots played from the rough to the green. This should result in an increase in the importance of driving accuracy."

This paper is written with this statement in mind, as below we analyze the extent to which the rule change has placed a premium on accuracy over power in golf tournaments sponsored the Professional Golfers' Association (PGA) Tour. To proxy for the accuracy-distance trade-off, we create an index for driving the golf ball. We find that golfers' average scores were not affected by the rule change, that more accurate golfers were more likely to be cut from the final two rounds following the rule change, and that more accurate golfers were more likely to finish better in tournaments after the rule change was implemented.

It is important to note, though, that the USGA and the R&A could have changed a number of aspects of the game in order to achieve its stated mission regarding accuracy. Certain

technologies of golf ball manufacturing club making- especially with regards to the driver- could have been outlawed, and the same goal would have been met. The USGA and the R&A chose to regulate club grooves, so suggesting that the governing bodies were engaging in political economy would not be an unfounded notion.

Economics and Golf-

Lazear and Rosen (1981) discuss the role played by idiosyncratic shocks in tournaments. If the promise of an idiosyncratic shock exists, it is critical that the shock affect contestants' outputs equally, or the incentive effects provided by the tournament will be damaged. In applied studies of tournaments, such as Knoeber (1989), Knoeber and Thurman (1995), and Chevalier and Ellison (1999), the treatment of idiosyncratic shocks to tournament contestants' output was discussed. In professional golf tournaments, organizers make attempts to cope with idiosyncratic shocks like weather in a manner that is equitable to all contestants. The groove rule change, however, is a shock that might favor players with certain skill sets over others. Because the penalty for not avoiding the rough has increased with the adoption of the rule change, it stands to reason that players who are relatively more accurate than their fellow competitors stand to gain the most from the rule change.

By banning certain grooves from competition, the PGA Tour has increased the price of inaccurate shots, as golfers will be less able to control shots from more chaotic environments with the mandated inferior grooves. In response to this cost change, players will have to substitute away from generating power and toward making more accurate swings, so as to avoid environments from which they have difficulty controlling their ball. Golfers with a comparative advantage in making accurate swings will not have to substitute away from their optimal strategies as much as golfers who were less accurate (and perhaps could generate more power).

Because golfers with different skill sets should be affected differently by the idiosyncratic shock caused by the rule change, the rule change offers us an opportunity to analyze the effect that an inequitable output shock has on the relative performance of golfers on the PGA Tour. In many ways, the ban on performance enhancing drugs has had on Major League Baseball, as the lion's share of the benefits from drugs flowed to players who hit for power. As is the case with the ban on clubs with U-grooves, participants in these markets were affected differently, depending upon the extent to which their skill sets were impacted by technology or rule changes.

-Data-

We used the databases constructed by ShotLink to analyze player performance across the 2009 and 2010 seasons. The ShotLink databases are a collection of information on every shot taken on the PGA Tour. We used a database that houses information on golfer performance data for each round played. For consistency's sake, we analyze only rounds played on 24 courses on which tournaments were played in both 2009 and 2010.

Across both seasons a total of 18694 rounds were analyzed, 9357 in 2009 and 9337 in 2010. In total, 515 players appear in the dataset. One player, Keith Clearwater, played in only one round. Steve Marino and John Senden appear most often in the dataset, as they both played 67 rounds in 2009.

We envision three types of golfers- accurate dinkers, less-accurate-power-generating gorillas, and players that exhibit a little bit of both characteristics. For every tournament in which a golfer participated, on non-par 3 holes, we calculated the percentage of tee shots that finished in the fairway and the average distance of each tee shot and ranked each golfer in both categories. A golfer's ranking is higher the larger is the percentage of fairways he hit and the longer is his average drive. Then, based on these rankings, we created a driving index that is a

weighted sum of the golfer's rankings in both categories. The "accuracy index," places all weight on hitting fairways. The "trade-off index" places an equal amount of weight on each category.[1]

We create these two indices because we want to gauge the relative importance of accuracy in both seasons. According to the USGA, a premium should have been paid to golfers who hit more accurate tee shots in 2010 compared to 2009. The first model places an inordinate amount of weight on driving accuracy as a determinant of relative driving ability, while the second model recognizes the inherent trade-off between accuracy and generating power. By comparing the results from each model we can make a determination regarding the extent to which accuracy was valued before and after the rule change.

-Results-

We study performance in three different parts- scoring across a season, relative performance in four round tournaments, and the probability of making a player surviving the second round cut that occurs in the majority of PGA Tour events. There is little evidence that suggests that more accurate golfers were paid a premium in 2010, following the rule change.

The results are presented in two parts. The first set comes from using the index that favors entirely driving accuracy over driving distance, while the second is from the index that splits the difference between the two statistics. To begin, we analyze the relationship between a golfer's average score for a season and his ability to drive the golf ball. For both the accuracy index and the trade-off index, we perform the following fixed-effect regression:

$$Average\ Score_{iy} = \beta_0 + \beta_1 * Driving\ Rank_{iy} + \beta_2 * Year\ Dummy + \beta_3 * Year * Driving_{iy} + B * Golfer_i + \varepsilon_{iy},$$

where

[1] Under the accuracy index, a weight of 1 is placed on the fairways hit ranking. Under the trade-off index, a weight of 0.5 is placed on both the fairway percentage ranking and the driving distance ranking.

a) average $score_{iy}$ = average score for golfer i in season y,

b) driving $rank_{iy}$ = season driving rank for golfer i in season y,

c) year dummy is an indicator that has a value of 1 for each observation from 2010 and 0, otherwise,

d) year*$driving_{iy}$ is an interaction between driving $rank_{iy}$ and the year dummy, and

e) $golfer_i$ is a player effect for each golfer in the dataset.

The error term is presumed to have a mean value of zero and to be unrelated to other error terms.

First, note that the results in table 1 and 4 show little evidence pointing to a change in the importance of accuracy from the tee in determining a golfer's average score, no matter which model is used. Not surprisingly, a golfer's relative performance of driving the golf ball is an important determinant in his score. In table 1, the coefficient on driving $rank_{iy}$ is 0.0920, which means that for every ten places a golfer can improve his relative performance of hitting fairways, his score will improve by 0.92 shots/round. When distance is factored into relative driving performance, the coefficient on driving $rank_{iy}$ increases to 0.0961 shots/round. Both coefficients are measured precisely, as each has a p-value that is low enough to meet any reasonable standard of acceptance. However, the value of the coefficient on the variable that interacts driving rank and a year indicator variable is insignificant, meaning that there was little difference between the relationship between average score and relative driving performance in 2009 and 2010.

The rule did have a marginal impact on golfers' relative finishes in tournaments, though. Table 2 shows that golfers ranked in the upper quartile of driving performance were almost 4% more likely to finish in the first quartile of scores for the tournament. The same difference

measure as measured with the trade-off index is 2.5%, which suggests that being more accurate off the tee allowed golfers to earn a higher premium in 2010 than in 2009.

Finally, the relationship between the likelihood of a golfer making the cut and his relative driving performance stayed consistent throughout both seasons, despite the rule change. Using the accuracy index, golfers with a driving index score in the first quartile were *less* likely to make the cut compared to similar golfers in 2009. (This is consistent with the regression results from above.) The more distance-oriented trade-off index shows that better drivers of the ball were more likely to make a cut following the rule change. The difference across the two indices in the likelihood of making a cut suggests that accuracy *alone* is not being paid a premium. As has always been the case, golfers who can generate power and not sacrifice control are the players who are the most likely to make cuts and play for high stakes on the weekend. And the importance of possessing that rare ability did not vanish with the onset of the groove rule change.

1. Accuracy Index Results

Table 1- Regressing Average Score on Driving Rank Score (N=575, R-squared = 0.8242)

Coefficient	Value	Standard Error
Avg. Driving Rank	0.0920	0.0255
Year2010*Driving Rank	-0.0349	0.0246

Table 2- Probability of Upper Quartile Finish Given Driving Index Ranking

	Post-Rule Change	Pre-Rule Change
First Quartile Driving	0.3783 (489)	0.3389 (481)
Second Quartile Driving	0.3036 (392)	0.2909 (416)
Third Quartile Driving	0.2445 (409)	0.2550 (404)
Fourth Quartile Driving	0.1794 (379)	0.2058 (379)

Table 3- Probability of Making Cut Given Driving Index Ranking

	Post-Rule Change	Pre-Rule Change
First Quartile Driving	0.6658 (820)	0.6957 (805)
Second Quartile Driving	0.5612 (743)	0.5416 (685)
Third Quartile Driving	0.5285 (613)	0.5467 (664)
Fourth Quartile Driving	0.4025 (569)	0.3955 (579)

When the import of accuracy is traded off for distance, the size of the premium paid to excellent drivers, as measured in strokes/round, falls, but only by a small amount. Again, the rule change appears to have no impact on golfers' scores, as Table 4 shows that the coefficient on Year*Driving Rank is not significantly different from zero.

The impact that golfers' driving index score on the probability of finishing in the upper quartile of the tournament appeared to have changed across the two seasons. Table 5 shows that a golfer with an upper quartile driving index score was more likely to finish in the upper quartile of a tournament after the rule change was implemented. On the other hand, relatively poor drivers of ball were penalized for their relative incompetence more in 2010 compared to 2009, as these golfers were over 4% less likely to finish in the first quartile of a tournament.

As far as making a cut is concerned, golfers in 2009 who were excellent drivers were more likely to make a cut compared to similar golfers in 2010. There was little difference across the two seasons in the likelihood of making a cut for golfers whose driving index scores were in the lower quartiles.

2. Trade-off Model

Table 4- Regressing Average Score on Driving Ranking Score (N=575, 0.8321)

Coefficient	Value	Standard Error
Avg. Driving Rank	0.0961	0.0253
Year2010*Driving Rank	0.0167	0.0239

Table 5- Probability of Upper Quartile Finish

	Post-Rule Change	Pre-Rule Change
First Quartile Driving	0.4348 (414)	0.4076 (422)
Second Quartile Driving	0.3047 (443)	0.2908 (423)
Third Quartile Driving	0.2437 (394)	0.2214 (411)
Fourth Quartile Driving	0.1459 (418)	0.1863 (424)

Table 6- Probability of Making Cut

	Post-Rule Change	Pre-Rule Change
First Quartile Driving	0.6574 (686)	0.7091 (684)
Second Quartile Driving	0.6215 (689)	0.5904 (686)
Third Quartile Driving	0.5343 (685)	0.5177 (678)
Fourth Quartile Driving	0.4044 (685)	0.4117 (685)

Further Directions-

This paper discusses the impact that the USGA's rule change on golf club groove construction had on performance in 2010, the first season the rule was implemented. Despite the USGA's reasoning for implementing the rule, in our first pass with the results, we find very little evidence suggesting that accuracy was paid a premium in 2010 compared to 2009. From a golfing perspective, these findings suggest that the USGA's decision to eliminate certain specifications of grooves is curious, as it has paid little to relatively accurate golfers, the type of golfers who were supposedly going to be the beneficiaries of the rule change. The lack of evidence of a premium suggests that the USGA might have to make changes to other aspects of

the game if it wants to mitigate the advantage that powerful players have over relatively short hitters. From the perspective of political economy, the USGA's decision to eliminate certain grooves is curious as it is one that could harm only certain club manufacturers. Like regulations that govern pollution or worker safety that are set forth by governments, the USGA could have played favorites or picked on enemies when it decided to regulate groove design.

With regards to the empirical question at hand, there are many future avenues for further study. Accurate swingers of golf clubs do not just show their stripes on tee boxes. Dead-eye hitters of iron shots might have earned a premium for their skill following the rule change. Or perhaps the premium for having a superior short game increased in 2010. The ShotLink database certain allows for us to study the premiums that might have been paid to golfers with comparative advantages in certain aspects of the game.

Also, analyzing the role that golfer skill sets play in determining their final relative output must be done with care, as golf is an activity in which the skills that need to be mastered in order to be effective are not easily separated. Defining what makes a golfer a good iron player, for instance, is hard to do, as the shots that golfers face from the fairway will inevitably be related to the shots that they struck from the tee. Often, statistical measures do not allow for this correlation across skills to be measured easily. In this way, golf is different from baseball, for instance, because baseball has skills that can be studied independently from each other. The nature of studying golf is more like determining what attributes make for a good teacher or a good CEO. So, there is much to be learned from attempts to measure relative performance in other disciplines.

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