Factors Impacting TV Viewership on the PGA Tour (Part 2)

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3.) Methodology

a) Data Summary

We successfully collected the following data for use / potential use in this project…

- Pre-Tournament Betting Odds for Major Championships (1993-2021)
- 3rd and 4th Round Nielsen TV Viewership Data for Majors only (1993-2021)
- PGA Tour Leaderboards scraped from ESPN.com (2018-2022)
- Weekly Official World Golf Ranking Updates (2019)
- Strokes Gained and Player Performance Statistics (2010-2021)

The first category of data we have successfully collected for use in this project encompasses every player's pre-tournament odds to win each of the four major championships dating back to 1993. Relating these odds to TV viewership is certainly a practical starting place, given everything we've discussed in the uncertainty of outcome section of the literature review. Unfortunately, as was articulated by Gooding and Stephenson, the most valued and variable rounds to track in terms of relating uncertainty of outcome to TV ratings are the 3rd and 4th round, meaning this pre-tournament data is potentially not as valuable as pre-round 4 betting odds. Ultimately, this pre tournament betting data proved to be insignificant, and our search for pre round 4 betting data was unsuccessful. Having said that, it is certainly an avenue of research that we would look to develop in the future, as it remains true that some relationship exists between the presence of heavy favorites and subsequent audience viewership. Given this discussion about pre-tournament vs pre-round betting odds, it is important to note that naturally, TV

viewership ratings are readily available on a round by round basis. As such, we were able to easily collect 3rd and 4th round major championship data, measured in terms of average viewership and Nielsen rating. This data was collected from SportsMediaWatch, the same source referenced in the Gooding and Stephenson paper. With a little more manual investigation, we found a more extensive sample that includes more tournaments per year over a shorter time period (2018-2022). In the end, we decided to model TV viewership with this smaller dataset that contains both majors and non-majors over a shorter time period, as we believe it is a better indicator of the current demand of PGA Tour viewership, especially when considering the impact of starpower mentioned in the literature review. In the end, our final dataset contains 45 tournaments from the 2018-2022 seasons, each of which has the following attributes: Year, Tournament, Major (dummy), Average Final Round Viewers, Nielsen Rating, Leader Margin (pre round 4), Margin of victory (post round 4), Playoff (dummy), Tiger Woods Making the Cut, Presesce of the following players in the top 10 at the end of the tournament: Tiger Woods / Phil Mickelson / Rory McIlroy / Bryson DeChambeau / Jordan Spieth / Justin Thomas, and a count of the number of star players (those listed above). The style we used in terms of splitting our attributes into tournament effects, uncertainty of outcome effects, and individual player effects was heavily influenced by the Gooding and Stephenson paper from 2017. Having said that, we chose this methodology path because we wanted to see if any individual star today has evolved to a point that comes close to Tiger in terms of attracting viewership. For this reason, we chose these 4 other players (Bryson DeChambeau, Justin Thomas, Jordan Spieth, and Rory McIlroy), as they were at the top of the PIP list in 2021, and are widely considered four of the most popular golfers in the

2018-2022 time period we are examining. Given the fact that Tiger and Phil have not played in nearly as many events over the past five seasons, we would expect their influence to still be strong, but maybe not as strong as their peak in the mid 2000s.

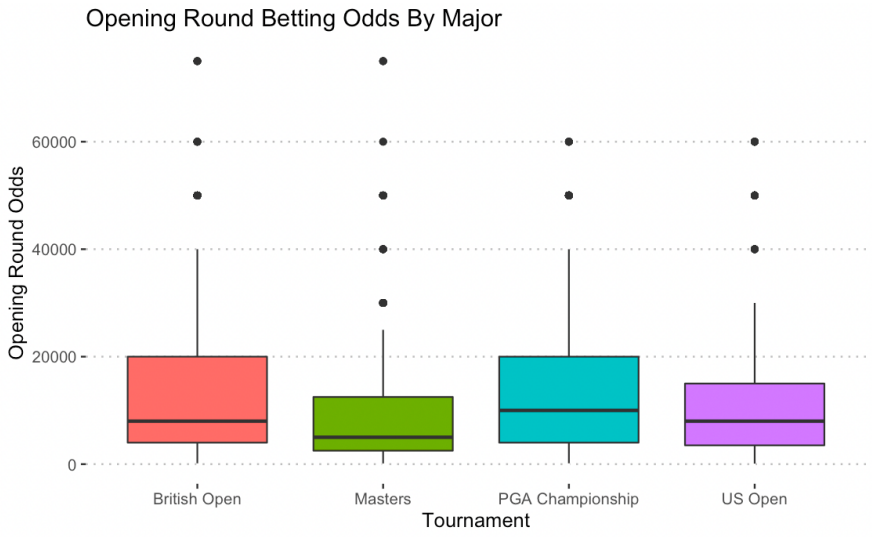
The next two datasets mentioned in the introduction of this section can be considered secondary applications that could prove to be valuable with a little more refinement. For the weekly OWGR rankings, this would serve the purpose of factoring in a player's current status and recent movement in the Official World Golf Rankings. If combined with final round viewership, we could likely find some relationship between the presence of any given category of player (Top 5, Top 10, Top 50 Ranked Player) and TV ratings. In terms of the final player performance dataset mentioned above (i.e round by round performance data from 2010-2021), this application would require a bit more work to apply, Essentially, this investigation of player performance could allow us to "type" players into more specific areas of performance, as it relates to entertainment value. For example, perhaps extraordinary drivers of the golf ball like Bryson DeChambeau, Rory McIlroy, and Cameron Champ impact viewership because of their aggressive style of play to an extent that is not factored in by their general popularity. Again, this would take some work to reduce endogeneity and properly cluster/evaluate golfers in this sense, but it's a factor we could consider, based on the data available. Lastly, you might have noticed the lack of tournament attendance data as an investigative variable. This is quite simply because this type of data is much harder to track in golf than we originally thought, and as a result, a clean dataset was incredibly difficult to find. If the ability to gather this type of data presents itself (and the concerns laid out in

Alavay, Gaskell, Leach, and Szymanski are found to be manageable), then attendance may prove to be an alternative measure of evaluating popularity.

b.) Exploratory Data Analysis

As explained in our data summary, the use of betting odds from 1993 - 2021 would be an interesting application of the uncertaintly of outcome question in golf. As such, we decided to begin our exploratory analysis by looking at the distribution of betting odds between the four major tournaments we have at our disposal. A box and whisker plot of the accompanying distributions are shown below. To avoid majorly skewed results, only players with sub +100000 odds are included in the plot.

Figure 1



As the graph shows, the PGA Championship & British Open have the highest interquartile ranges, with the US Open third, and Masters fourth. This makes sense considering that the Masters has only about half the number of players than either of the other three majors. The other interesting thing about the Masters (and the British Open to a lesser extent) is that the 1st and 2nd quartile appear to be extremely top heavy, meaning more players occupy a smaller range of betting odds at the beginning, before quickly

expanding with the major longshots. Given the nature of betting odds, this isn't too surprising to see as a concept overall, but it's still interesting to note the differences between each tournament's distribution. Overall, analyzing betting odds would have certainly been an interesting avenue to explore, but given the constraints mentioned in previous sections (i.e data from non major tournaments from 2018-2022), they were not ultimately included in the final regression models.

c.) Modeling Methodology

Now that we have examined past research, looked into our data sources, and began exploratory analysis, it is now time to evaluate and apply specific modeling techniques to the question at hand – What factors influence PGA Tour viewership?. We'll begin by evaluating the modeling methodologies and variable setups that make the most sense, given everything we've reviewed thus far. The first technique or concept that we will include would be this idea of tournament and player effects measured within a standard OLS model. In the Gooding and Stephenson paper, they made sure to include fixed effects for the tournament as well as player effects for Phil Mickelson and Tiger Woods, who at the time were by far the most popular players in professional golf. In today's day and age, the presence of either Tiger or Phil as a top 10 player on a Sunday leaderboard is nonexistent in that it's happened only two times in the past three years (Phil ~ 2021 PGA Championship, Tiger ~ 2019 Masters). As such, we thought it would be interesting to apply this methodology to the new wave of talent on the PGA Tour (Bryson DeChambeau, Rory McIlroy, Jordan Spieth, and Justin Thomas.). Besides Tiger and Phil, these three players are probably the most popular and potentially influential

players that the PGA Tour has to offer. As the PGA Tour prepares for life after Tiger and Phil (Tiger, age 46 & Phil, age 51), this seems like a valuable application of our research question. In terms of data manipulation, we included similar measure of "presence" variables (i.e Rory top 10 after Round 4) in addition to our tournament effects and uncertainty of outcome measures (Pre / Post round margin, Playoff, etc.). Below is the first iteration of our multiple linear regression with all relevant variables used as predictors of Final Round Viewership.

Model 1:

Model 1: All Attributes

	Dependent variable:
	FinalRoundAvgViewers
year	-0.232
	(0.199)
tournamentFarmers Insurance Open	-0.429
	(0.945)
tournamentGenesis Invitational	-0.250
	(0.926)
tournamentMasters Tournament	6.405***
	(0.944)
tournamentMemorial	-0.892
	(0.947)
tournamentOpen Championship	1.493
	(0.992)
tournamentPGA Championship	2.688**
	(0.997)
tournamentQuicken Loans / Rocket	0.142
	(1.193)
tournamentU.S Open	1.369
	(0.892)

Playoff	-0.619
	(0.781)
LeaderMarginEnteringFinalRound	-0.134
	(0.146)
LeaderMarginEnd	-0.279
	(0.170)
TigerMakeCut	0.354
	(0.686)
TigerTop10	0.600
	(0.723)
PhilTop10	-0.401
	(1.193)
RoryTop10	-0.226
	(0.467)
SpiethTop10	-0.250
	(0.716)
BrysonTop10	-0.507
	(0.555)
ThomasTop10	-0.286
	(0.704)
Constant	473.089
	(401.889)
Observations	45
R^2	0.865
Adjusted R^2	0.753
Residual Std. Error	1.244 (df = 24)
F Statistic	7.699^{***} (df = 20; 24)
Note:	*p<0.1; **p<0.05; ***p<0.01

In the above output, it is apparent that Major tournaments are the most important factor in determining viewership size. This general idea is consistent with previous research on the topic, and is not very surprising. From there, we see that most other variables, including Tiger Woods Top 10 / Make cut, Leader Margin, and all other player effect attributes are also not statistically significant. For the Tiger Woods variables, this is

a bit surprising, but is likely just a result of the lack of sample size in the 2018-2022 dataset combined with the presesce of unneccesary variables in the current model. In an attempt to correct this mistake and create a more accurate view of PGA Tour viewership, we'll adjust our model to include the "StarTop10Count" variable in place of the unneccesary player effects (Phil, Rory, Bryson, Spieth, Thomas), while also adjusting for heterskadasicity via robust standard errors for applicable attributes. The output for the refined model is shown below.

Model 2:

Model 2: Refined Attributes

	Dependent variable:
	FinalRoundAvgViewers
year	-0.220
	(0.162)
tournamentFarmers Insurance Open	-0.482
	(0.875)
tournamentGenesis Invitational	-0.225
	(0.755)
tournamentMasters Tournament	6.511***
	(0.802)
tournamentMemorial	-0.859
	(0.836)
tournamentOpen Championship	1.581*
	(0.795)
tournamentPGA Championship	2.714***
	(0.791)
tournamentQuicken Loans / Rocket	0.069
	(1.061)
tournamentU.S Open	1.486*
	(0.766)

Playoff	-0.549
	(0.661)
LeaderMarginEnteringFinalRound	-0.113
	(0.112)
LeaderMarginEnd	-0.278*
	(0.136)
TigerMakeCut	0.325
	(0.554)
TigerTop10	1.045
	(0.627)
StarTop10Count	-0.309
	(0.255)
Constant	447.823
	(326.656)
Observations	45
R^2	0.864
Adjusted R^2	0.786
Residual Std. Error	1.159 (df = 28)
F Statistic	11.076*** (df = 16; 28)
Note:	*p<0.1; **p<0.05; ***p<0.01

The results from this second regression are much more interesting for a variety of reasons. For one, as we would expect, the Major tournaments remain the key indicator of PGA Tour viewership, but in this version, the "LeaderMarginEnd" variables ends up being significant at the 10% level with a p-value of .051. To interpreate, this would provide some evidence that the uncertainy of outcome hypothesis is indeed a key indicator of viewership during the final round, given the -.278 coefficient. Logically, this makes sense, as tournaments with a lower ending margin of victories are likely more closely contested and more entertaining to watch. In addition, although the output does not specifically show it, the Tiger Woods Top 10 variable is approaching significance with a p-value of .106. As hinted at above, this dataset only had nine instances of Tiger

Woods in the top 10, which is likely why this variable is not as significant as past research. Having said this, there remains no doubt that *when* Tiger Woods tees it up, he is the center of attention, even if this model doesn't support it to the extent it has in the past.

4.) Conclusion

In summation, our research into the factors impacting TV, attendance, and overall popularity on the PGA Tour proved extremely insightful. As noted in the introduction, it was our hope that this paper would not only analyze an updated dataset on the topic of PGA Tour viewership, but lay the groundwork for a more comprehensive study, expanding upon the sentiments described throughout all segments of this paper. Before conducting extensive research into this topic, there were several different avenues that we considered exploring, and upon completing the literature review, data investigation, and subsequent modeling, the significance of the uncertainty of outcome variable (MarginEndofRound) is certainly a new and interesting conclusion that sheds light onto the preferences of golf viewers in an ever-evolving landscape of golfers and fans alike. In addition, the results of the player effects portion of the models show that no individual players have near the effect that Tiger Woods has had on the game in terms of attracting viewership. Even the top tier of stars in today's game (Rory McIlroy, Jordan Spieth, Justin Thomas, and Bryson DeChambeau) do not move the needle on their own. As a final thought, the reason we chose to investigate this topic is not only because we are fans of golf, but that we see the clear opportunity to investigate the post Tiger Woods world that is quickly approaching the PGA Tour. In addition, with the incentivization of the LIV golf circuit, both golf brands and tours alike are searching for every possible insight

into the mind of a golf fan. With time, dedication, and patience, we truly believe that the concepts outlined in this paper will prove to be extremely valuable to the golf industry.

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