Poker Superstars: Skill or Luck?
Similarities between golf—thought to be a game of skill—and poker

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"Why do you think the same five guys make it to the final table of the World Series of Poker every year? What are they, the luckiest guys in Las Vegas?"
—Mike McDermott (Matt Damon in the 1998 film ‘Rounders’)

The popularity of poker has exploded in recent years. The premier event, the World Series of Poker Main Event, which costs $10,000 to enter, has increased from a field of six in 1971 to 839 in 2003 and 5,619 in 2005. Broadcasts of poker tournaments can frequently be found on television stations such as ESPN, Fox Sports, the Travel Channel, Bravo, and the Game Show Network. These tournaments consistently receive high television ratings.

Poker also has garnered the attention of many influential academics. It served as a key inspiration in the historical development of game theory. John Von Neumann and Oskar Morgenstern claim that their 1944 classic, Theory of Games and Economic Behavior, was motivated by poker. In the text, they described and solved a simplified game of poker. Other famous mathematicians/economists such as Harold Kuhn and John Nash also studied and wrote about poker.

For all its popularity and academic interest, the legality of poker playing is in question. In particular, most regulations of gambling in the United States (and other countries) include poker. In the United States, each state has the authority to decide whether it is legal to play poker for money, and the regulations vary significantly. In Indiana, poker for money is legal only at regulated casinos. In Texas, poker for money is legal only in private residences. In Utah, poker for money is not legal at all. The popularity of online poker for money has raised further questions about the right (or ability) of states to regulate this activity. At the national level, the U.S. Department of Justice recently stated that the Federal Wire Act (the Interstate Wire Act) makes online casino games illegal (in addition to sports wagering), although the U.S. Fifth Court of Appeals subsequently ruled that interpretation incorrect.

That said, there are heated arguments on both sides of the regulation debate. Those in favor of regulating argue that poker is primarily a game of luck, such as roulette or baccarat, and that it should be regulated in a manner similar to those games. Those in favor of lifting regulations argue that it is primarily a game of skill—a sport such as tennis or golf—and it should not be regulated at all. So, is professional poker a game of luck or skill?

Several 'star' poker players have repeatedly performed well in high-stakes poker tournaments. While this suggests skill differentials, it is far from conclusive. In how many poker tournaments have these stars participated in which they did not do well? Furthermore, even if poker competition among top players were random, we would expect a few players to get lucky and do well in multiple tournaments.

We use data from high-stakes poker and golf tournaments and identify the rates at which highly skilled players are likely to place highly. We use golf as a comparison group, as it is an example of a game thought to be primarily skill-based. If the data from golf and poker have many similarities, especially in terms of repeat winners, those data could suggest poker is equivalently a game of skill.

Data
In a large poker tournament, individuals pay an entry fee and receive a fixed number of chips in exchange. These chips are valuable only in the context of the tournament; they cannot be used elsewhere in the casino or exchanged for money. Players are randomly assigned to tables, typically including nine players and one professional dealer. Players remain in the tournament until they lose all their chips, at which point they are eliminated. Some tournaments include a “rebuy” option, where players can pay a second entry fee and receive more tournament chips. Others include an “add-on” option, where they can pay a small extra fee (often used to tip the dealers) and receive more tournament chips. At some point during the tournament, these options disappear. As players lose their chips, they are merged to create a roughly equal distribution of players per table.
Identifying skill discrepancies among top poker players is complicated by the lack of precise tournament data. The lists of entrants for large poker tournaments are not available, and outcomes are typically only recorded for players who finish in the final two or three tables. Thus, it is not possible to know the total number of tournaments for which a given player has participated. In our data, we have 899 poker players who finish in the top 18 of a high-stakes tournament at least once. The average tournament has between 100 and 150 entrants. Thus, a given person has an 11%–17% chance of entering a given tournament. Due to the lack of data on tournament attendance, it is impossible to know if players who frequently show up at final tables are more skilled than other players, or if they simply play in more tournaments.

To circumvent this selection issue, we employ a strategy that focuses on individuals who finished in the top 18 in high-stakes tournaments (the two final tables). As data are typically available for all players who finish in the top 18 of a given tournament, we can overcome the selection issue by focusing on just these individuals. Thus, while we are unable to identify the number of tournaments an individual has played in, we are able to identify the number of times a player has played in a tournament of 18 players. We can analyze whether certain players consistently outperform other players conditional on being in the top 18, or whether the outcomes appear to be random.

We use data from limit or no-limit Texas Hold'em tournaments that are part of the World Series of Poker, World Poker Tour, or World Poker Open. Texas Hold'em is a variant of poker in which all players are given two personal cards and there are five community cards that apply to all players' hands.
A second test we use is a comparison of the results between golf and poker tournaments. We compare the size of the coefficients of interest. If golf has statistically larger coefficients than poker (in absolute value), then there is more skill in golf than in poker. If the coefficients in golf are not statistically different than those in poker, we will conclude that poker has similar amounts of skill (and luck) as golf.

Results

Table 2 presents the results. Robust standard errors are presented in brackets below the coefficient values. Our first analysis involves simply looking at the poker data and identifying whether previous success predicted current success. Clearly it does. The coefficient on experience (whether a player has previously finished in the top 18) is significantly and negatively correlated with a player's rank in the given tournament, suggesting an increase in finishing (−.78 ranks, \( p<.01 \)). The coefficient on finishes (the number of times a player has previously finished in the top 18) is significantly and negatively correlated with a player's rank in the given tournament, suggesting an increase in finishing as well (−.22 ranks, \( p<.05 \)). The coefficient on previous rank (the average rank for the player in previous tournament finishes) is significantly and positively correlated with a player's rank in the given tournament (−.20 ranks, \( p<.01 \)). These results clearly suggest poker is, at least somewhat, a game of skill.

But, how much skill? A comparison with golf can illuminate this question. If we compare the estimated coefficients on the experience variable, we find that these coefficients are not statistically different from each other (\( t = 1.35, p>.05 \)). Similarly, there are no statistically significant differences between the estimated coefficients on finishes (\( t = 0.10, p>.05 \)). For the final measure of previous performance, previous rank, the coefficient for poker is statistically larger than the coefficient for golf (\( t = 2.24, p<.05 \)).

Figures 2a and 2b show two of these relationships graphically. Figure 2a depicts the average rank in a given tournament as a function of finishes. Figure 2b depicts the average rank in a given tournament as a function of previous rank. Both show the average rank, as well as a linear fit of the data. These figures
measures of previous performance are statistically significant who finish in the top 18 of a given tournament. Although our analysis does not exactly the same as the slope from the regressions, as we have simplified the variable finishes for ease of display.

visually depict our regression results from Table 2. Both poker and golf show a significant negative relationship between current rank and finishes. Poker, but not golf, shows a significant positive relationship between current rank and previous rank. That said, the R-squared values for the regressions we report for both poker and golf are extremely low (ranging from 1.1%–2.8%). This suggests that, in general, it is very difficult to predict the ordering of a given set of poker or golf players. Although our measures of previous performance are statistically significant predictors of current performance, they still only explain a small amount of the overall variation that exists in poker and golf, as one might expect to be the case in many sports and games, especially those with explicit randomization such as poker.

Discussion and Conclusion
We present evidence of skill differentials among poker players finishing in one of the final two tables in high-stakes poker tournaments. We show two main results. First, there appears to be a significant skill component to poker. Previous finishes in tournaments predict current finishes. Second, we find the skill differences among top poker players are similar to skill differences across top golfers.

While our analysis provides evidence for skill being a factor in poker (significant regression coefficients), the current evidence needs further support from other analyses (primarily because of the small R-squared). Thus, this analysis should be considered a first attempt to answer this question, and we hope this article will stimulate further efforts.

A second limitation of the present study is that models do not specifically account for repeated observations from some players in the analyses and that results within a tournament for different players are correlated. These aspects of the data would impact standard errors in analyses, but perhaps not too strongly. First, most players appear in just a few tournaments, so they are used not many times. In poker, this is especially true. Second, few pairs of players appear in the same pairs of tournaments. Thus, the amount of information that could be learned by modeling ranks for pairs of players is quite limited. This is especially true in poker.

Further Reading